

ARRANGED MARRIAGE, PARTNER TRAITS AND PARENTAL INVESTMENT:
EXAMINING THE REPRODUCTIVE COMPENSATION HYPOTHESIS IN
HUMANS

by

Annemarie M. Hasnain



A thesis

submitted in partial fulfillment

of the requirements for the degree of

Master of Arts in Anthropology

Boise State University

December 2020

© 2020

Annemarie M. Hasnain

ALL RIGHTS RESERVED

BOISE STATE UNIVERSITY GRADUATE COLLEGE

DEFENSE COMMITTEE AND FINAL READING APPROVALS

of the thesis submitted by

Annemarie M. Hasnain

Thesis Title: Arranged Marriage, Partner Traits and Parental Investment: Examining the Reproductive Compensation Hypothesis in Humans

Date of Final Oral Examination: 05 August 2020

The following individuals read and discussed the thesis submitted by student Annemarie M. Hasnain, and they evaluated their presentation and response to questions during the final oral examination. They found that the student passed the final oral examination.

Kristin Snopkowski Ph.D. Co-Chair, Supervisory Committee

John Ziker, Ph.D. Co-Chair, Supervisory Committee

Kathryn Demps, Ph.D. Member, Supervisory Committee

The final reading approval of the thesis was granted by Kristin Snopkowski, Ph.D., and John Ziker, Co-Chairs of the Supervisory Committee. The thesis was approved by the Graduate College.

DEDICATION

To my family, Zille, Jaafar, Yusuf and Jennie

Thank you for all of your support, encouragement and love as I worked on this project.

I wanted to also thank our cats, Zander (2008-2020) and Grayson for their furry help during many late nights of writing.

ACKNOWLEDGMENTS

I want to thank my thesis committee who generously gave to me their time, insights and encouragement:

Kristin Snopkowski, Ph.D.

John Ziker, Ph.D.

Kathryn Demps, Ph.D.

I also want to thank the Boise State University Anthropology Department for their support during my journey through both undergraduate and graduate school. Your dedication to both your profession and your students is truly inspiring.

ABSTRACT

Both sexes choose mates based on qualities that will enhance offspring viability and quality. In some cases individuals are forced to reproduce with less desirable mates which has been shown to result in lower quality offspring. The Reproductive Compensation Hypothesis (RCH) predicts that parents who mate under constraint will increase their reproductive effort and investment in offspring to compensate for lowered offspring viability. Evidence for the RCH has been found in several animal species; however it has not been examined in humans. One possible type of mate choice constraint in humans is that of arranged marriage in which parents or others choose mates for individuals. In order to test the RCH, I examine whether there are differences in both partner traits between women in arranged marriages and those in self-choice marriages, and differences in parental investment between women in arranged and self-choice marriages using data from the Indonesian Family Life Survey. Except for husband's education level, no differences were found in mate characteristics between the husbands of women in self-choice marriages and those in arranged marriages. Marriage type did not significantly correlate with parental investment except for number of live births. This correlation, however, was not in the predicated direction. Results show that women in self-choice marriages had more offspring (controlling for marriage duration) than woman in arranged marriages. It is possible that arranged marriage is not a true constraint on mate choice or that parental investment measures used in this study need to be more refined.

TABLE OF CONTENTS

DEDICATION	iv
ACKNOWLEDGMENTS	v
ABSTRACT	vi
LIST OF TABLES	x
LIST OF FIGURES	xi
CHAPTER ONE: INTRODUCTION	1
The Reproductive Compensation Hypothesis	3
Evidence for The Reproductive Compensation Hypothesis	4
Mate Choice Constraints in Humans	9
Study Purpose and Hypotheses	18
Summary	21
CHAPTER TWO: THE INDONESIAN SETTING.....	22
General Information	22
Demographic Trends.....	23
Marriage in Indonesia	24
Arranged Marriage in Indonesia	26
Prenatal Care, Birthweight and Breastfeeding	27
Summary	30
CHAPTER THREE: QUESTION 1: IS THERE A DIFFERENCE IN MATE CHARACTERISTICS BETWEEN HUSBANDS OF WOMEN WHOSE FIRST	

MARRIAGE WAS ARRANGED AND HUSBANDS OF WOMEN WHO CHOSE THEIR FIRST HUSBANDS?: METHODS AND RESULTS	32
Methods	32
Results	34
Education	36
Husband’s Assets Before Marriage	37
Husband Personality Traits	38
Summary	40
CHAPTER FOUR: QUESTION 2: ARE THERE DIFFERENCES IN PARENTAL INVESTMENT STRATEGIES BETWEEN WOMEN WHOSE FIRST MARRIAGE WS ARRANGED AND THOSE WHO CHOSE THEIR OWN HUSBANDS?: METHODS AND RESULTS	42
Methods	42
Results	44
Number of Prenatal Clinic Visits	45
Birthweight	45
Duration of Breastfeeding	46
Number of Births Per Years Married	47
Summary	48
CHAPTER 5: DISCUSSION AND FUTURE STUDIES	50
Discussion	50
Arranged Marriage Vs. Self-Choice Marriage	50
The Reproductive Compensation Hypothesis	55
Future Studies	58
Arranged Marriage Vs. Self-Choice Marriage	58

The Reproductive Compensation Hypothesis.....	59
Summary	60
REFERENCES.....	62

LIST OF TABLES

Table 3.1.	Descriptive statistics of variables	35
Table 3.2.	Multiple regression analyses showing Husband's Education and Husband's Assets by Marriage Type and controlling for Wife's Education and Wife's Assets.....	37
Table 3.3.	Multiple regression analyses showing Husband's Personality Traits by Marriage Type and controlling for wife's education level,wife's assets and wife's personality traits.....	39
Table 4.1.	Descriptive statistics of variables	44
Table 4.2.	Multiple regression analyses showing Prenatal Clinic Visits by Marriage Type and controlling for Husband's Education, Wife's Education, Husband's Income and Number of Children.	45
Table 4.3.	Multiple regression analyses showing Birthweight (in kg) by Marriage Type and controlling for Husband's Education, Wife's Education, Husband's Income, Number of Children and Mother's Height and Weight.	46
Table 4.4.	Cox regression analysis showing Duration of Breastfeeding by Marriage Type and controlling for Husband's Education, Wife's Education, Husband's Income, and Number of Children.	47
Table 4.5	Multiple regression analyses showing Live births per years married by Marriage Type and controlling for Husband's Education, Wife's Education, and Husband's Income.	48

LIST OF FIGURES

Figure 1.	Mean values of personality traits by marriage type	40
-----------	--	----

CHAPTER ONE: INTRODUCTION

Choosing a mate varies across species; in some species such as the elephant seal (*Mirounga angustirostris*), dominant males monopolize access to females (Clutton-Brock and McAuliffe, 2009). In others, such as swordtail fish (*Xiphophorus species*), females choose their mates based upon size and symmetry (Morris et al., 2006). In general, the sex which invests the most in the offspring of a given species is the sex which does the choosing. The sex with the least investment competes with members of their own sex for mating opportunities with the former (Trivers, 1972).

The choice of mate can affect the quality of the resulting offspring. Female guppies (*Poecilia reticulata*) prefer larger males. Offspring of female guppies that mated with larger males had higher growth rates than those of females who mated with smaller males. In addition, females who mated with larger males had daughters with higher reproductive rates (Reynolds and Gross, 1992).

A number of studies have examined the viability of offspring when mate choice has been constrained. In zebra finches (*Taeniopygia guttata*), pairs that were allowed to freely mate, showed a 37% higher reproductive success than pairs that were forced to mate (Ihle et al., 2015). Gouldian finches (*Erythrura gouldiae*) mate assortatively based on head-color morphs linked to particular genotypes. When forced to breed in captivity with incompatible genotypes, the mortality rate is 40.2% greater for sons and 83.8% for daughters than for broods produced from genetically compatible pairs (Pryke and Griffith, 2009).

Bluhm and Gowaty (2004) studied whether constrained mate choice affected offspring viability of mallard ducks. To do so, they placed female mallards with either her preferred male or non-preferred male in breeding trials. Offspring of mothers who mated with non-preferred males had significantly lower egg-to-independence viability and significantly fewer independent offspring at the age of release than mothers who mated with preferred partners.

Drickamer et al. (2000) also looked at the effects of mating with preferred or non-preferred males in female house mice, *Mus musculus*. They first allowed females to discriminate behaviorally between two males and then paired the discriminating females with preferred or non-preferred males. In comparison to females mating with preferred partners, those mating with non-preferred partners produced significantly fewer litters than those with preferred mates. The progeny of preferred matings were superior to those of non-preferred matings in a number of ways. Sons were socially dominant, and adult offspring built better nests. In field enclosures more offspring of preferred matings survived to 60 days after introduction and established larger home ranges. The study demonstrated that both offspring survival and behavior were positively affected when female mice mated with preferred partners. Anderson and colleagues (2007) found similar results with *Drosophila pseudoobscura*: females and males mating with non-preferred had offspring of lower viability, than those who mated with preferred partners.

Does mating with non-preferred partners always negatively impact the quality of the resulting offspring? A number of studies have tested the Reproductive Compensation Hypothesis which suggests that parents whose offspring result from

constrained matings may actually invest more in their offspring than parents in non-constrained matings.

The Reproductive Compensation Hypothesis

The Reproductive Compensation Hypothesis proposes that parents and prospective parents who mate under constraint will increase their reproductive effort and investment in offspring to compensate for lowered offspring viability (Gowaty et al., 2007). The hypothesis was originally proposed to explain how females might reproduce under social constraints on mating such as male–male competition, sexual coercion of females and forced copulation, mate guarding, and female choice in species in which females are invulnerable to social coercion. The reproductive compensation hypothesis also predicts that both sexes may compensate for less than ideal matings (Gowaty, 2008).

The reproductive compensation hypothesis includes at least two assumptions. The first assumption is that when constrained individuals have other mate options, they will resist reproduction with non-preferred mates. If resistance is unsuccessful, individuals will “attempt to make the best of a bad job.” The second assumption is that offspring viability is negatively affected when mate choice is constrained (Gowaty et. al, 2007).

Constrained parents may employ a number of strategies in order to increase offspring survival when forced by ecological or social forces to mate with non-optimal partners. Pre-mating compensatory strategies in males include enhanced male-male aggression to increase access to females, and an increase in rate of attempted matings with multiple females. Females may compensate by increased extra-pair matings in order to increase access to favorable alleles (Gowaty, 2008).

The reproductive compensation hypothesis makes a number of predictions about how both males and females mating under constraints will compensate during copulation. Males are predicted to ejaculate more sperm which increases the number and variation among male gametic haplotypes, which females can then sort. Females are then predicted to physiologically select among the sperm of non-preferred males to increase the chances that the zygotes will survive to reproductive age. Females may also produce more oocytes, and both sexes are predicted to contribute more nutrient rich and immune system-enhancing resources to the developing gametes and zygotes (Gowaty, 2008).

Post-copulatory, the reproductive compensation hypothesis predicts that constrained mothers will lay bigger eggs than unconstrained mothers, more reliably incubate eggs than unconstrained parents, nurse their offspring longer than unconstrained mothers, and through various physiological species-dependent mechanisms, decrease the susceptibility to disease in embryos and young (Gowaty, 2008).

Evidence for The Reproductive Compensation Hypothesis

A number of studies have examined the evidence for the Reproductive Compensation Hypothesis. Most studies have focused on birds, fish or insects, but several studies have looked at evidence for the Reproductive Compensation Hypothesis in mammals.

Gowaty and colleagues (2007) tested the whether *Drosophila pseudoobscura* males might compensate for mating with non-preferred females by increasing the number of sperm in an ejaculate. They found that males who were forced to reproduce with non-preferred females ejaculated significantly more sperm than did males with females they did prefer. In addition, it was also found that males mated to female that were forced to

mate with them also ejaculated more sperm than males mated to females that preferred them. The authors could not determine whether excess sperm in the constrained matings was fertilizing sperm or the type of sperm that delivered nutrients to females. It was also possible the excess sperm was due to an anticipated sperm competition. The authors were not able to test whether the sperm carried more variable haplotypes which is what would be expected if males were compensating for lower offspring variability due to constrained mating.

In broadnosed pipefish (*Syngnathus typhle*), females transfer eggs to males who then care for the embryos in a brood pouch. Both sexes prefer larger mates and as predicted by Trivers (1974), males are choosier in their mate selection since they have greater reproductive investment than females. Goncalves and colleagues (2010) studied whether the differential allocation hypothesis (which predicts parents will invest more in the offspring of a preferred mate) or the reproductive compensation hypothesis operated in the broadnose pipefish. Females were mated to both large males (preferred mates) or small males (non-preferred mates). The authors found that when females mated with small males, the eggs transferred to those males contained 11% more protein than the eggs transferred to large males. This finding supported the reproductive compensation hypothesis which predicts that females should increase resource allocation to each offspring when mating with smaller partners in order to compensate for possible lower quality care.

Mallard ducks were also found to compensate for lower quality mates. Gowaty and colleagues (2007) tested the prediction that parents would attempt to compensate for decreased offspring viability by mating female mallards randomly with preferred or non-

preferred partners. Offspring survival of both first and second year virgin females was significantly decreased when females were constrained to reproduce with non-preferred partners. However second-year virgins laid larger eggs, a compensatory strategy, which increased the quality of their offspring. The authors speculated that first-year virgins did not compensate due to trade-offs with their own growth.

In another bird species, the zebra finch (*Taeniopygia guttata*), Bolund and colleagues (2009) found that female zebra finches, when paired with males of low genetic quality, invested more resources into their eggs as evidenced by larger eggs and yolk carotenoid content. Female finches were also found to deposit more testosterone in eggs when paired with a male of lower parental quality as measured by the male's previous success in raising offspring. Female collared flycatchers also seemed to follow a similar compensatory strategy by depositing more testosterone into eggs when mated with younger males compared to mating with older males (Michl et al., 2004). This may be because younger males have lower genetic quality, less parental experience or are less willing to invest in parental care than older males (Michl et al., 2004). Navara and colleagues (2006) also found that female house finches deposited significantly more androgens into eggs when mated with less attractive males.

Byers and Waits (2006) examined the reproductive compensation hypothesis in pronghorn antelope (*Antilocapra americana*). Before estrus, female pronghorns visit several potential mates that have widely-spaced harems. They winnow out males which do not show effective harem defense and in this process, only a small subset of males end up mating with females. The authors found that offspring of the more attractive males had a greater chance of surviving to weaning and had greater longevity than the offspring

of less attractive males. Those who survived to weaning had faster growth rates than those that did not survive to weaning. Females mated with less attractive mates compensated by increasing the rate of milk delivery to their young.

In summary, evidence does support the reproductive compensation hypothesis in several non-human species. However, the hypothesis has not been tested in non-human primates nor has it been examined in relation to parental investment in humans.

The Differential Allocation Hypothesis

Another hypothesis that has been proposed to explain the effect of mate quality on parental investment is the differential allocation hypothesis (DAH). The differential allocation hypothesis first put forth by Nancy Burley (1986) who proposed that an individual's mating attractiveness will affect the amount of parental investment it can receive from a mate. Individuals will invest more in the offspring of attractive mates whereas the offspring of unattractive mates will incur lower parental investment per offspring. Burley examined her hypothesis in zebra finches which provide bi-parental care. Her hypothesis also proposes that individuals that reproduce with high quality mates may incur more parental costs than their mate, in order to obtain or maintain attractive mates. In other words, an attractive mate may restrict their own parental investment which is made up for by their partner. In a study of time-budget estimates of parental investment in zebra finches, Burley (1988) found that relative attractiveness and the amount of parental investment were related. Attractive birds incurred smaller parental expenditures (they restricted their PI) whereas unattractive birds had larger parental expenditures (increased their PI). Sheldon (2000) reviewed a number of experimental tests in the literature. Support for the DAH was found in several species

including birds, insects, house mice and waterfrogs. Differential allocation in birds was measured by such outcomes as clutch size, testosterone content of eggs, survival and egg size. In waterfrogs, it was measured by clutch size; in field crickets by the probability of breeding and clutch size; and in house mice by the increased probability of producing a litter (Sheldon, 2000).

Harris and Uller (2009) developed a model to test differential allocation (DAH) vs. reproductive compensation (RCH). They found increased investment when mating with high-quality mates was the most common strategy for females. When mating with low-quality mates, increased reproductive investment occurred only when the model included very specific combinations of parameters. In their research on parental effort and mate compatibility in Goudian finches, Pryke and Griffith (2009) found that females increased their provisioning efforts nearly twice as much when breeding with compatible males compared to mating with incompatible males (those of a different genotype). In this case, genetic incompatibilities between different parental genotypes have a high fitness cost with a higher rate of offspring mortality than when mating to a genetically compatible male. The authors suggest that reproductive compensation is more likely to occur in situations where low-genetic quality offspring, if provided with adequate resources during development, may have the same potential survivorship and reproductive success as high-quality offspring (Pryke and Griffith, 2009). Differential allocation may be more likely to occur if partner quality is expected to vary over an individual's lifetime (Bolund et al., 2009). Since there is a cost associated with reproductive effort and parental investment, and if an individual is likely to mate with a

higher-quality partner in the future, it may be advantageous for the individual to invest less in offspring of a lower-quality mate.

For the purposes of this thesis, I will focus on the Reproductive Compensation Hypothesis because it is particularly relevant when mating is constrained. However, if my findings suggest that women with more choice in their mates invest significantly in more in their reproductive efforts than those with less choice, it may be that the Differential Allocation hypothesis better explains parental investment patterns in humans.

Mate Choice Constraints in Humans

In order to test the reproductive compensation hypothesis in humans, it is first necessary to consider what sorts of constraints on mate choice exist in human populations. The most extreme case is that of rape in which the victim is forced to have sex with the perpetrator under duress. Other circumstances may force people to accept less than desirable mates. One such circumstance is that of arranged marriages a unique human behavior where parents and sometimes other kin, attempt to control the mate choice of their offspring (Dubbs et al., 2010; Batabyal, 2001). Although stories of romantic love are found throughout the world, arranged marriage seems to be the norm rather than the exception (van der Berg et al., 2013).

Arranged marriage has been a mating strategy in many cultures which may function to allow parental control over their families and offspring, preserve ancestral lines, strengthen kinship groups, expand family property and forge political alliances (Buunk et al., 2008). Although evolutionary theories have proposed both female choice and male-male competition as the primary sexual selection force in humans, Apostolou argues that both the anthropological and historic records indicate parental mate choice,

particularly male parental mate choice, has been the major sexual selection force during much of human evolution (2014a). In general, males have particularly sought to control their daughter's mate choice as daughters constitute "a scarce reproductive resource" (Apostolou, 2014b).

Using Murdock's *Atlas of World Cultures* (Murdock, 1981) and *Atlas of World Cultures* (Price, 1989), Apostolu examined the prevalence of arranged marriages in hunter and gatherer societies around the world (Apostolu, 2007). A subsample of societies under-represented in the *Atlas of World Cultures* was also included. The sample consisted of 9 African societies, 16 East Eurasian societies, 19 Insular Pacific societies, 85 North American societies, 47 Arctic and Sub-Arctic societies, and 14 South American societies for a total of 190 societies. Four types of marriages were reported: 1) parental arrangement in which parents choose mates although offspring may also have some say; 2) close kin arrangement in which family members other than parents choose mates, although parents also participate in the process; 3) courtship subject to parental approval in which the individuals find their own marriage partners with choices subject to parental approval; 4) and courtship marriages in which individuals are free to choose and marry whomever they wish. Societies may have more than one type of marriage arrangement. Parental arrangement was primary in 130 (68%) societies, followed by arrangement by close kin in 33 societies (17%). Courtship subject to parental approval was the primary form of marriage in 15 societies (8%) and marriages which partners freely choose their mates was the primary form of marriage in only 8 (4%) societies. Parental arrangement was the secondary marriage type in 145 (76%) societies with close kin arrangement the secondary marriage type in 54 (28%) societies and courtship subject to parental approval

secondary in 37 (19%) societies. In the three most common categories, (94% of societies) parental arrangement, close-kin arrangement, and courtship with parental approval, parents play a prominent role in controlling the mate choice of their children.

Parental control of marriage arrangements would not be considered a constraint on mate choice as long as the interests of both parents and offspring do not conflict. In other words, the ideal mate for an individual would also be the ideal in-law for his/her parents. However, this may not be the case as the traits that offspring seek in a mate may not be the same traits that parents value in an in-law. According to Trivers (1974), this is because a child's mate choice can affect the child's ability to behave altruistically towards his or her natal relatives after marriage. Parents prefer sons or daughter in-laws that will benefit them and other kin, such as the parent's younger children. The traits that parents want in their future in-laws may not be the same traits that their children want in their future mates. This sets up a potential conflict between parents and offspring over mate choice.

Two hypotheses have been proposed to account for this conflict; the *evolutionary trade-offs hypothesis* and the *compromise in desirable traits hypothesis* (Apostolou, 2017). The first hypothesis suggests that children want mates with characteristics that denote high genetic quality. This comes at the cost of lower parental investment. This is based on evidence that suggests men high in genetic quality may choose to invest less in their offspring and invest more in their efforts to seek and obtain mates (Gangestad & Simpson, 2000). Parents, however, want mates for their children that exhibit characteristics suggesting strong parental investment (Buunk et al., 2008; van den Berg et al., 2013). The *compromise in desirable trait hypothesis* states that since choosing a mate

involves compromises in preferred traits, the compromises that children make in their mate choice come at a cost to their parents (Apostolou, 2011; Apostolou, 2017).

Children must make compromises based on their own mate value which affects the type of mate they can attract. Apostolou (2017) points out that both hypotheses involve trade-offs and compromises but differ in that in the trade-off hypothesis, daughters prefer mates with higher genetic quality which gives them genetic benefits with the cost mostly paid by their parents. In the compromise theory, children compromise on traits such as good family background in order to get desired traits such as good genetic quality. This compromise is costly to their parents as good genetic quality doesn't benefit them as much as it does their children. Parents pay an opportunity cost by allowing their children to choose their own mates (Apostolou, 2017). Parents may end up with in-laws that do not provide them benefits such as a higher status or cooperation with the parent's in-group (Apostolou, 2017). Parents pay a cost according to both hypotheses.

Both hypotheses suggest that children prefer traits that indicate high genetic fitness whereas parents prefer traits for their children that indicate high parental investments. The ideal mate would be one that exhibits genetic quality and provides substantial parental investment, but evidence suggests that individuals with traits indicating high genetic quality such as high levels of attractiveness spend more effort in mating than in parental investment (Gangestad & Simpson, 2000). Parents, of course, should want a certain level of genetic quality for their children's mates as that will affect potential grandchildren. However, mates that tend to be of very high genetic quality may not remain with their mates and children, thus forcing grandparents to allocate more to needier grandchildren, possibly at an expense to other grandchildren (Snopkowski &

Sear, 2015). van der Berg and colleagues (2013) argue the parent-offspring conflict over mate choice is the result of conflict over distribution of resources. Although parents would prefer to allocate resources equally to all of their grandchildren (Trivers, 1974), they may end up allocating resources among daughters depending on the resource-provisioning abilities of son-in-laws. Daughters whose mates provide few resources may receive more resources from parents than daughters whose mates are good providers. It is in the parents' best interest then, to ensure sons-in laws are good providers even if it means a compromise in genetic quality. This can lead to a potential conflict between daughters and parents; daughters may look for mates of high genetic quality and compromise on traits that indicate a good provider, whereas parents look for sons-in laws that are good providers at the expense of high genetic quality.

If children's spouses provide high parental investment it will allow parents to allocate their limited investment elsewhere – potentially to younger children or other grandchildren. Potential in-laws that show other traits, such as traits indicating in-group cooperation are also preferred by parents. This appears to be particularly true in “collectivist” societies which value group solidarity, group decisions, loyalty to one's family and giving into the wishes of one's family (Buunk et al., 2010). In-laws that share these values may be more likely to care for elderly parents, and provide resources to other family members. Parents have also been found to value social status in an in-law more than children do in a mate (Dubbs & Buunk, 2010; Buunk et. al., 2008) which suggests that good in-laws may improve the social status of parents. At the very least, a good social status is unlikely to cause harm to the parents' reputation.

Traits Preferred by Individuals Vs. Traits Preferred by Parents

A number of studies have examined the differences between traits that individuals prefer in a mate and those preferred by parents. In general, it appears that children prefer traits that indicate genetic quality whereas parents prefer traits that connote parental investment (Apostolou, 2008; Buunk et al., 2008; Buunk and Solano, 2010; Dubbs and Buunk, 2010; Dubbs et al., 2013; Bovet et al., 2018; Perilloux et al., 2011; Fugere et al., 2017a; Fugere et al., 2019).

Attractiveness is a trait that can signal genetic quality (Apostolou, 2008). A moderate level of attractiveness was found to be necessary for both daughters and their parents when rating potential mates for their daughters (Fugere et al., 2017a, 2019). In general, children value physical attractiveness in a mate more than their parents value it for a potential in-law (Apostolou, 2008; Apostolou, 2011; Buunk et al., 2008; Buunk and Solano, 2010; Dubbs and Buunk, 2010; Dubbs et al., 2013; Bovet et al., 2018; Perilloux et al., 2011). Other traits that individuals value in a spouse more than their parents value in a potential in-law include having an exciting personality (Buunk et al., 2008; Dubbs and Buunk, 2010; Dubbs et al., 2013; Perilloux et al., 2011; Apostolou, 2011). Traits parents preferred in a potential in-law more than individuals preferred in a spouse were having a similar religion, similar ethnicity, and the same social class, all traits that suggest parents prefer in-laws that are similar to themselves (Buunk et al., 2008; Dubbs and Buunk, 2010a; Dubbs et al., 2013; Perilloux et al., 2011; Buunk and Solano, 2010; Apostolou, 2011; Apostolou, 2008). In-laws that share the same values and belong to the same group may extend the parents' alliances and enhance social status (Perilloux et al., 2011).

Dubbs, Buunk and colleagues have examined the differences in traits that are unacceptable to individuals and those individuals perceive as unacceptable to their parents (Buunk et al., 2008; Dubbs et al., 2013; Buunk and Solano, 2010). The surveys given to participants included a list of traits. These traits were divided into traits that connoted heritable fitness, traits that indicated cooperation and a short list of “other.” The authors hypothesized that children would have a stronger preference for traits suggesting heritable fitness, whereas parents would prefer traits that suggest parental investment and in-group cooperation (Buunk et al., 2008). Traits that indicated lack of heritable fitness included physical unattractiveness, considerably shorter/taller than self, physically unfit, fat, bad smell, lacks sense of humor, lacks artistic abilities, lacks creativity, and unintelligent. Traits indicating a lack of parental investment and cooperation were lacks good family background, different ethnic background, different religious beliefs, a lower social class than self, divorced, poor, not respectful and obedient, low education, and does not like children. Other traits that did not fit into either category were unfriendly and unkind, very different attitudes than self, physical or mental illness, and not a virgin. The surveys were given to Dutch students, Kurdish students in Iraq, exchange students in the Netherlands, students in the United States (Buunk et al., 2008), Japanese students (Dubbs et al., 2013) and students in Argentina (Buunk and Solano, 2010). As hypothesized by Buunk, Dubbs and colleagues, students were more likely to find lack of traits signaling heritable fitness more unacceptable to them in a mate and perceived a lack of traits signaling parental investment and cooperation to be more unacceptable to their parents. Overall traits that were the most unacceptable to students across most groups were being physically unattractive, lacking a

sense of humor and having a bad smell (Buunk et al., 2008). Other traits that were unacceptable to students were lacks exciting personality (Dutch and American students, Buunk et al., 2008), lacks creativity (Exchange students, Argentinian students, Japanese students) or artistic ability (Japanese students). Traits that were perceived as being especially unacceptable to parents were being divorced (Dutch students, exchange students, American students, Argentinian students) and having a different ethnic background (Dutch students, exchange students, Kurdish students, American students, Japanese students, Argentinian students). Other traits unacceptable to parents included not being respectful or obedient (Dutch students and Japanese students) and having a different religion (exchange students, American students, Japanese students and Argentinian students).

Perilloux and colleagues (2011) asked 100 male and 217 female American university students for preferences in mate traits. Both parents of 30% of the students completed the survey with approximately half of the students having at least one parent complete the survey. Both daughters and sons rated kindness, intelligence, attractiveness and exciting personality as the top four important traits although the ranking differed between daughters and sons. For example, sons rated ranked physical attractiveness as the top trait, whereas for daughters it was ranked fourth. Parents completing the survey also ranked kindness and intelligence as highly important but ranked religion as more important than did their offspring. Overall, parents ranked religious, good housekeeper, healthy, and kind higher than offspring, with children ranking physically attractive and exciting personality higher than their parents.

Fugere and colleagues (2017b) studied similarities and differences in ideal mate preferences between college-age students (women, $n=42$; men, $n=38$) from the United States, and one or both of their parents (mothers, $n=52$; fathers, $n=43$). As with other studies, they found some traits signaling genetic quality such as physical attractiveness were rated as more important by children than their parents. Some support was found for the hypothesis that parents valued traits that are associated with in-group cooperation more than their children. However, the authors also found significant similarities between parents and children within families. For instance, creativity, healthy weight, a pleasing smell and similar ethnic background were significantly important among women and their mothers. A good sense of humor and similar religious background were significantly correlated between women and their fathers.

In summary, most individuals, regardless of ethnic background, prefer spouses that are physically attractive, have an exciting personality, have a sense of humor and are perhaps creative and/or artistic. Parents prefer mates for their children that belong to the same ethnic group and religion, are from a similar social class, and are respectful and obedient.

Certainly parental mate choice in humans may result in mates that are less desirable for their offspring. In order to determine whether or not the Reproductive Compensation Hypothesis applies to humans, I will first determine whether mating under mate choice constraints, such as an arranged marriage, affects mate quality. Then I will examine whether parents invest differently in their offspring based on their marital arrangement. If the reproductive compensation hypothesis is occurring in humans, I

would expect that if males are of lower genetic quality in arranged marriages, women will invest more in their offspring to compensate.

Study Purpose and Hypotheses

The purpose of the current study is to answer the following questions: (1) Is there a difference in mate characteristics between husbands of women whose first marriage was arranged and husbands of women who chose their first husbands? (2) Are there differences in parental investment strategies between women whose first marriage was arranged and those who chose their own husbands?

Each of the two overarching research questions can be broken down into several more focused questions. For the first question, is there a difference in mate characteristics between women in arranged marriage and self-choice marriage, this study will answer the following questions: Is there a difference in highest education level between the husbands of women in arranged marriages and husbands of women in self-choice marriages? Is there a difference in the value of assets owned before marriage between the husbands of women in arranged marriages and husbands of women who chose their own mates? Is there a difference in selected personality traits between the husbands of women in arranged marriages and husbands of women who chose their own mates?

The four personality traits studied are “does a thorough job,” “is considerate and kind to almost everyone,” “original, comes up with new ideas,” and “outgoing, sociable.” The first two traits, “does a thorough job” and “is considerate and kind to almost everyone” are traits that are hypothesized to be preferred by parents as they connote responsibility and cooperation. The second two traits, “original and comes up with new

ideas” and “outgoing, sociable” are hypothesized to be traits that are preferred by children as they may indicate genetic fitness. In several studies children were found to prefer mates that were creative/artistic and mates with an exciting personality (Apostolou, 2011; Buunk et al., 2008; Dubbs et al., 2013; Buunk and Solano, 2010; Perilloux et al., 2011).

Prior research indicates that women who chose their own mates are better educated and look for mates with similar educational achievements (Jones, 2005). On the other hand, parents may look for son-in laws that will be able to support their daughters and any resulting grandchildren. This will allow parents to allocate resources more evenly to all of their grandchildren (van der Berg et al., 2013).

It is predicated then, that women in arranged marriages will have husbands that have more assets prior to marriage, and will show a positive correlation for the personality traits “does a thorough job” and “is considerate and kind to almost everyone” than the husbands of women in self-choice marriage. On the other hand, it is predicted that women in self-choice marriages will have husbands with a higher education level display the personality traits “original and comes up with new ideas” and “outgoing, sociable” more than the husbands of women in arranged marriages.

To-date, most studies that have examined the differences between traits preferred by individuals in a spouse and those preferred by parents for an in-law used surveys to determine preferences. I am unaware of any studies that have examined whether there is an actual difference in traits between the spouses of those in arranged marriages compared to those in self-choice marriages.

For the second question, are there differences in parental investment strategies between women in arranged marriages and self-choice marriages, I will answer the following: Is there a difference in the number of prenatal clinic visits of women in arranged marriages and women in self-choice marriages? Is there a difference in baby's birthweight of women in arranged marriages and women who chose their own mates? Is there a difference in duration of breastfeeding between women in arranged marriages and women who chose their own mates? And finally, is there a difference in number of children per years married for women in arranged marriages and women in self-choice marriages?

Based on the Reproductive Compensation Hypothesis, we predict that women in arranged marriages will invest more in their offspring than women in self-choice marriages in order to make up for possibly lower quality offspring. More specifically, we predict that women in arranged marriages will have more clinic visits than women who chose their own husbands, will have babies with higher birthweights than women who chose their own husbands, will breastfeed longer than women who chose their own husbands, and will have more children per years married than women who chose their own husbands.

In order to examine both questions, data was used from the 5th wave of the Indonesia Family Life Survey (IFLS) which was collected in 2014. The sample is representative of about 83% of the Indonesian population and includes over 30,000 individuals living in 13 of the 27 provinces in the country (Strauss et al., 2016).

Summary

Mate choice has important consequences for resulting offspring. Poor quality mates may result in poor quality offspring, whereas high quality mates may result in offspring with increased viability and quality. In some cases, individuals are forced to mate under constraint with low quality mates. The Reproductive Compensation Hypothesis, which proposes that individuals who mate under constraint will increase their reproductive effort and parental investment to compensate for lowered offspring viability, has been shown to operate in several non-human species. A possible form of mate constraint for humans is that of arranged marriage where parents or others chose mates for individuals. A number of studies have found that the traits parents prefer in a mate for their children are different than the traits their children prefer in a mate for themselves. Using data from the Indonesian Family Life Survey, this current study will examine whether there is a difference in mate characteristics between husbands of women in arranged marriages compared to husbands of women who choose their own partners. This study will also examine if there is a difference in parental investment between women in arranged marriages compared to women who choose their own husbands.

CHAPTER TWO: THE INDONESIAN SETTING

Since my study uses data from the Indonesia Family Life Survey (IFLS), it is important to have some understanding of the Indonesian setting. This chapter starts by providing general information about Indonesia and its demographic trends, and will then provide a brief overview of general marriage patterns including arranged marriage. Prenatal care in Indonesia and information on infant birthweight patterns and breastfeeding trends in Indonesia will be reviewed as well.

General Information

Indonesia is located in Southeast Asia between the Indian and Pacific Ocean. It is the largest island nation in the world with 13,466 islands making up its archipelago. Of these, 922 are permanently inhabited. Indonesia has a population of more than 267 million people and is the world's third largest democracy (Central Intelligence Agency, 2020). Indonesia has over 300 distinct ethnic and linguistic groups (World Population Review, 2020) with the Javanese making up a little over 40% of the population. Other major ethnic groups included the Sundanese (15.5%), Malay (3.7%), Batak (3.6%) and the Madurese (3%).

Although the official language of Indonesia is *Bahasa Indonesia*, many other local languages and dialects such as Javanese are spoken. Altogether 700 different languages are used in Indonesia. The majority of Indonesians are Muslim (87.2%) making it the largest Muslim majority country in the world. Other religions practiced in Indonesia are Protestantism (7%), Roman Catholicism (2.9%), Hinduism (1.7%), and

other which includes Buddhism and Confucianism (0.9%) (Central Intelligence Agency, 2020).

Demographic Trends

Qibthiyah and Utomo (2016) identified several key demographic changes in contemporary Indonesia. Among those changes are a slight decline in the average household size, a varying age of first marriage, and fertility rates that are just above replacement level. In general, age at first marriage has increased for women. In the early 1990's it was 22 for women and by 2006, had reached 23.2. Between, 2011-13, it fell to 22.4 but in 2015 the estimated mean was 23.1 for women and 27.5 for men.

In 1969, the fertility rate was around 5.6 children per women but fell to 2.4 in the early 2000s (Qibthiyah and Utomo, 2016). Indonesia was one of the first developing countries to establish a comprehensive family planning program which also has contributed to a decrease in fertility (Hatton et al., 2018). Hatton and colleagues (2018) found that, consistent with other studies, more educated mothers had fewer children. Father's highest level of education was also negatively associated with number of children.

Jones (1977) found fertility patterns varied across geographic regions of Indonesia. The highest levels of fertility were found in West Java, rural Sumatra and rural Sulawesi. Urban areas such as urban Sulawesi and urban Sumatra had lower fertility perhaps due to delay of marriage and restraints on fertility due to marrying at a relative older age.

Other factors may influence the number of children at the family level. For instance, Nguyen (2019) found that Indonesian parents tend to prefer a mixed-gender

family. Families in which the first two children are of the same sex are more likely to have a third child.

Marriage in Indonesia

Indonesian society, in general, considers marrying and having children extremely important with unmarried women “seen as incomplete” (Jones, 2005). Among the Javanese, marriage is nearly universal (Smith-Hefner, 2005). There is no one pattern that defines Indonesian marriage as marriage customs vary between regions of the country as well as between ethnic groups. Although the majority of Indonesians are Muslims, state policies and local traditions, known as *adat*, also influence marriage customs (Buttenheim and Nobles, 2009; Howell, 2016). *Adat* are the set of local practices, traditions and rules that guide all aspects of Indonesian social and economic life, including marriage (Buttenheim and Nobles, 2009). They are extremely complex and it has been estimated there are around 19 different *adat* systems (Katz and Katz, 1975). *Adat* affects aspects of marriage such as age at marriage and post-marriage residency of the couple (Buttenheim and Nobles, 2009). Traditions such as *kawin lari*, a form of “socially sanctioned elopement” is still a common way to marry in Lombok, with the marriage later formalized under Islam (Platt, 2012).

Throughout most of Indonesia, age at first marriage has traditionally been very low, particularly for girls (Buttenheim and Nobles, 2009; Jones, 2001; Rumble et al., 2018). The 1975 Marriage Law set the minimum age for marriage at 16 for women and 19 for men (Katz and Katz, 1975). However, this law is not always followed (Jones, 2001). Using data from the 2012 Indonesian Demographic and Health Survey, Rumble et al. found that out of 6578 females, approximately 17% and 6% reported being married

before 18 and 16 years respectively (2018). Marriage in which either partner is under the age of 18 is defined as child marriage and, particularly for girls, puts them at higher risk for maternal mortality and can adversely affect the lives of their children (Rumble et al., 2018).

The age of first marriage for Indonesian women has been rising in some groups particularly among more educated women and those in urban settings (Buttenheim and Nobles, 2009; Nobles and Buttenheim, 2008; Jones, 2005). In Java, for instance, expanding education and employment opportunities for women have provided incentives for parents to allow their daughters to delay marriage and stay in school (Smith-Hefner, 2005). In addition, there is an increase in the number of never-married women in some parts of Indonesia. Jones (2005) found that in Jakarta the percentage of women remaining unmarried at ages 30-34 was 9% in 1990 but had risen to 14 % in 2000. This follows a pattern similar to that in urban areas in other Asian countries over the past few decades (Jones, 2005). As is the increase in age of first marriage, this pattern is commonly attributed to the rise in women's education levels. Women delay marriage until they have completed their education and in some cases, better-educated women may be "choosier" in their choice of spouse (Jones, 2005). However, Buttenheim and Nobles (2009) found that *adat* norms still continue to strongly influence actual age at marriage across ethnic groups, even when controlling for education.

Utomo and McDonald (2016) examined ethnicity and marriage patterns using 2010 Census data from over 47 million couples in Indonesian. In general, Indonesians marry within their own ethnic groups across all Indonesian provinces. Younger people with higher levels of education and living in larger urban areas such as Jakarta and North

Sumatra were found to have a lower likelihood of endogamy. The authors also found that religion is still a major criterion for choosing a spouse, even in marriages where individuals choose their own partners.

Arranged Marriage in Indonesia

Indonesian weddings are communal events and represent the union of two families as well as the union of two individuals (Utomo and McDonald, 2016). Traditionally, marriages were arranged by the parents and occurred when the individuals, particularly daughters were very young (Heaton et al., 2001; Smith-Hefner, 2005; Jones, 2001) and individual needs were secondary to the needs of the family and the community (Williams, 1990). Ideally, daughters were kept at home until marriage and in rural areas especially, parents arranged an engagement shortly after girls began menstruation (Smith-Hefner, 2005). Men tended to have more input into mate choice than women (Malhorta, 1991; Williams, 1990). The rate of divorce for these early arranged marriages was high and among the Javanese, for instance, first marriages seemed to be regarded as “trial relationships” that were not expected to last (Heaton et al., 2001). Individuals had more choice in their second or later marriages.

Indonesian marriages are still arranged by parents although not to the extent that they once were. Using the Indonesian portion of the Asian Marriage Survey conducted in Central Java during 1979-1980 Malhorta (1991) looked at who chose an individual's first spouse. The sample included 537 rural and 412 urban middle-class women and their husbands. The survey asked whether the first marriage was (1) totally initiated and arranged by the parents, (2) initiated and arranged by parents with the respondent's approval, (3) initiated and chosen by respondent with parental approval, or (4) totally

initiated and chosen by the respondent. For women in the 1935-43 cohort, 66.5% of marriages for rural women were arranged by parents, with 40.5% arranged by parents for urban women. By 1953 and on, 38.9% of marriages for rural women were arranged by parents, and 10.4% arranged by parents for urban women. The number of marriages arranged by parents with respondent's approval remained at about 20% from 1935 and on for rural women, and fell from 20.8% between 1935-43 to 14.6% for urban women. Self-choice first marriages increased from 2.4% in the earliest group of rural women to 13.6% from 1953 on. For urban women, self-choice first marriages increased slightly from 10.4% in 1935-43 to 13.5% in 1953 and on. The greatest change in marriage choice patterns was in category 3, spouse choice initiated and chosen by respondent with parents' approval. For rural women the percentage rose from 11% to 26.8% and for urban women it rose from 28.2% to 61.5%. The author concluded that although the trend over time indicates young women and men are increasingly seeking out their own mates, parents are still important in the decision-making. Other researchers have also found that younger couples are increasingly seeking out their own mates but are still strongly influenced by parental wishes (Nilan, 2008; Jones, 2005). The divorce rate in Indonesia, once of the highest in the world, has declined as well, possibly due to the decrease in early arranged marriages and higher satisfaction in marriages where individuals can exercise at least some degree of choice (Heaton et al., 2001).

Prenatal Care, Birthweight and Breastfeeding

In Indonesia, maternal mortality has been a major concern (Frankenburg and Thomas, 2001; Fauk et al., 2017). Indonesia ranks fourth highest in maternal mortality among Southeast Asian countries (Kurniati et al., 2018). In 2012 the maternal mortality

rate (MMR) was 359 per 100,000 live births (Fauk et al., 2017; Kurniati et al., 2018) which is far higher than the United Nations fifth Millennium Development Goals target number of 102 per 100,000 live births for Indonesia by 2015 (Fauk et al., 2017).

In order to reduce the MMR, the Indonesia government has provided maternal care services including a program to train more mid-wives and sending them to villages throughout the country (Frankenburg and Thomas, 2001). The goal, based on World Health Organization recommendations, is for expectant mothers to have a minimum of four prenatal clinic visits (Fauk et al., 2017; Kurniati et al., 2018). Although number of pregnant women in Indonesia meeting the recommended number of prenatal visits has increased from 56% in 1991 to 86% in 2014 (Kurniati et al., 2018), the number is still below the national goal of 90% prenatal attendance (Fauk et al., 2017).

Several factors have been found to influence the use of prenatal services. Women who had obtained higher education levels were more likely to use prenatal services (Kurniati et al., 2018; Fauk et al., 2017) as were women who held paying jobs (Kurniati et al., 2018) and women with higher family income (Fauk et al., 2017). Women who were 30 years or older when they had their first child were twice as likely to use prenatal services as younger women (Kurniati et al., 2018). Factors associated with negative use of prenatal services were working in agriculture (Kurniati et al., 2018) and living in rural areas (Fauk et al., 2017). Fauk and colleagues found that women living in rural areas were more likely to hold traditional beliefs about pregnancy and consider it a natural process that does not require any special care. Women in rural areas may also prefer to use traditional birth attendants (TBAs) for their care and will only use a midwife if

there's a problem with the pregnancy (Fauk et al., 2017). Income may also affect use of prenatal services due to the cost of traveling to a clinic (Fauk et al., 2017).

Using data from waves 1 and 2 of the Indonesia Family Life Survey, Frankenburg and Thomas (2001) examined whether village midwives made a difference in pregnancy outcomes. Birthweights were significantly higher in villages with midwives. Low birthweight is a risk factor for infant mortality in the neonatal period (Trisnantoro et al., 2010) and increases the risk for stunting during the first two years of life (Adair and Guilkey, 1997). Stunting has been associated with impaired intellectual function and growth in childhood, and impaired cognitive ability and increased risk of obesity and chronic diseases later in life (Adair and Guilkey, 1997). Data from the United Nations Development Programme (UNDP), 2014, shows that Indonesia has one of the highest prevalences of stunting in Southeast Asia (Indriyati and Handayani, 2018).

One of the most important post-birth parental strategies is that of investing in optimal nutrition for the child, particularly during the first two years of life (Indriyati and Handayani, 2018). Optimal nutrition during this period in which breastfeeding is a crucial component, reduces child mortality and illness, fosters intellectual and physical development, and may reduce the incident of chronic disease later in life (WHO, 2020). UNICEF and WHO recommend that breastfeeding should be initiated within 1 hour of birth; babies should be exclusively breastfeed for the first 6 months of life; and should be continued up to 2 years or longer along with the introduction of complementary foods at 6 months (WHO, 2020).

Although Indonesia has over 8,000 community health centers and there have been improvements in immunization rates and skilled workers attending births, the rate of

exclusive breastfeeding of children of children under 6 months of age has decreased from 40% in 2002 to 32% in 2007 (Trisnantoro et al., 2010). Using data from the 2012 Indonesian Demographic and Health Survey, Indriyati and Handayani (2018), examined how the mother's age at first marriage, her working status, exposure to media and gender of the child affected the behavior of exclusive and continued breastfeeding. Women who married later were less likely have exclusive (0- 6 months) and continued breastfeeding (6-23 months) than women who married early. Women who worked also had a lower probability of continued breastfeeding compared to non-working mothers and male infants between 0-5 months were more likely to be exclusively breastfed than female infants. Other factors that increased the probability of the mother providing continued breastfeeding were living in rural areas compared to urban areas, having more autonomy in managing household income, and listening to radio at least once a week. However, exposure to newspapers and magazines once a week had a significantly negative correlation with breastfeeding.

Summary

Indonesia, located in Southeast Asia between the Indian and Pacific Ocean, is the largest island nation in the world, and has a population of more than 267 million people with over 300 distinct ethnic and linguistic groups. It is undergoing a number of demographic changes including a slight decline in average household size, an increasing age at first marriage for women and a fertility rate that is just above replacement level. Despite these changes in family structure, marrying and having children is still an extremely important aspect of Indonesian society. No one pattern defines Indonesian marriage but local traditions, known as *adat* still guide Indonesian social and economic

life, including marriage. Many Indonesian marriages are still arranged by parents or other relatives although younger couples are increasingly choosing their own mates. Even when choosing their own mates, couples are strongly influenced by parental wishes.

Maternal mortality continues to be a major concern in Indonesia with Indonesia ranking fourth highest in maternal mortality among Southeast Asian countries. The Indonesian government's goal is for expectant mothers to have a minimum of four prenatal clinic visits. Although the number of pregnant women in Indonesia meeting the recommended number of prenatal visits has increased from 56% in 1991 to 86% in 2014, the number is still below the national goal of 90% prenatal attendance. Breastfeeding rates are also of concern. The World Health Organization recommends that children under 6 months of age be exclusively breastfed; however the rate of the number of children under 6 months of age exclusively breastfed in Indonesia has decreased from 40% in 2002 to 32% in 2007. Reasons for both the less than recommended number of clinic visits and the decrease in breastfeeding vary, but overall, the changing role of women in Indonesia and changing family structure along with traditional views all play a part.

CHAPTER THREE: QUESTION 1: IS THERE A DIFFERENCE IN MATE CHARACTERISTICS BETWEEN HUSBANDS OF WOMEN WHOSE FIRST MARRIAGE WAS ARRANGED AND HUSBANDS OF WOMEN WHO CHOSE THEIR FIRST HUSBANDS?: METHODS AND RESULTS

In this chapter, I describe the methods used to examine the first question, is there a difference in mate characteristics between husbands of women whose first marriage was arranged and husbands of women who chose their first husbands? I predicted that women in arranged marriages will have husbands that have more assets prior to marriage, and will show a positive correlation for the personality traits “does a thorough job” and “is considerate and kind to almost everyone” than the husbands of women in self-choice marriage. I also predicted that women in self-choice marriages will have husbands with a higher education level and a positive correlation for the personality traits “original and comes up with new ideas” and “outgoing, sociable” than do the husbands of women in arranged marriages. The results of my analyses are also described in this chapter.

Methods

Data was used from the fifth wave of the Indonesian Family Life Survey (IFLS) which was collected in 2014. The sample is representative of about 83% of the Indonesian population and includes over 30,000 individuals living in 13 of the 27 provinces in the country (Strauss et al., 2016). Data on marriage includes whether or not the first marriage was arranged and by whom. The IFLS surveys and procedures were reviewed by IRBs (Institutional Review Boards) at RAND in the United States and by

Survey Meter in Indonesia (Strauss et al., 2016). All requirements for consent for adults and children were met and approved before fieldwork could begin.

Women included in the study were only those who were married once as the surveyed only collected data on who arranged the women's first marriage and details about their current spouse. If their current spouse was not the first spouse, the characteristics of their first spouse were not recorded. Respondents were asked, "Who chose your husband (from your first marriage?)" The total number of women who were married once was 3,860. Choices for this question were "Parents", "Self", "Family" and "Other." For the purposes of this study, "Parents" and "Family" were combined into one variable, "Parents/Family." Out of the 3,860 women, 3,542 (91.76%) chose their own spouse, 300 (7.77%) had marriages arranged by Parents/Family and 18 (.47%) had marriages arranged by Other.

Husband's education, husband's assets before marriage and four self-rated personality characteristics were examined in order to test whether there was a difference in husband traits between women in arranged marriages and those who chose their own husbands. Husband's assets before marriage were log transformed because of the extremely large numbers and positive skew of the distribution (median = 5,000,000 rupiahs, range = 0-8,000,000 rupiahs). Women's assets before marriage were also log transformed for the same reason (median = 1,000,000 rupiahs, range = 0-300,000,000 rupiahs). This made the data less skewed.

The personality characteristics used in this study were selected from fifteen self-rated personality traits. Personality traits were self-rated on a 5-point scale: 1) Disagree strongly, 2) Disagree a little, 3) Neither agree nor disagree, 4) Agree a little, and 5) Agree

Strongly. Two of the traits, “does a thorough job” and “is considerate and kind to almost everyone,” were traits that were predicted to be preferred in an in-law. The other two traits, “is original, comes up with new ideas,” and “is outgoing, sociable” were predicted to be traits that would be preferred in a spouse. Since a woman’s traits may also play a role in the type of husband she marries, wife’s education, wife’s assets before marriage (log transformed), and personality traits were used as control variables. The wife and husband’s religion were also examined. Information on religion for both husband and wife was available for 3,504 husband-wife pairs. Out of this total, only 23 were in mixed religion marriages. Since almost everyone (99.3%) married within their own religion, religion was excluded as a predictor.

A multiple regression model using IBM SPSS 25 statistical package was used to analyze the data. Marriage type (“Parents/Family”, “Self”, and “Other”) was a categorical variable. Spouse’s education, assets before marriage, and personality traits were analyzed separately each as dependent variables. Wife’s education and wife’s assets were control variables in the models. Wife’s personality traits (“does a thorough job,” “is considerate and kind to almost everyone,” “is original, comes up with new ideas,” and “is outgoing, sociable”) were included as controls in the models predicting the husband’s personality traits.

Results

The descriptive statistics for the independent, dependent and control variables are included in Table 3.1.

Table 3.1. Descriptive statistics of variables

Variable	n	mean/%	Sd
Assets			
Husband (log transformed)	2693	5.17	2.93
Wife (log transformed)	3418	4.27	3.05
Marriage type			
Self-chosen marriage	3542	91.76%	
arranged marriage by parents/family	300	7.77%	
arranged marriage by non-family	18	0.47%	
Education			
Husband			
None	28	0.82%	
Elementary	679	19.87%	
Junior High	742	21.71%	
Senior High	1407	41.18%	
College	561	16.42%	
Wife			
None	41	0.96%	
Elementary	882	20.69%	
Junior High	977	22.92%	
Senior High	1603	37.60%	
College	760	17.83%	
Personality Traits (range: 1= disagree strongly, 5=agree strongly)			

Husband			
does a thorough job	2906	4.15	0.67
considerate and kind to almost everyone	2906	4.13	0.64
original, comes up with new ideas	2906	3.80	0.88
outgoing, sociable	2906	4.18	0.65
Wife			
does a thorough job	4316	4.11	0.70
considerate and kind to almost everyone	4316	4.08	0.64
original, comes up with new ideas	4316	3.59	0.97
outgoing, sociable	4316	4.11	0.68

Education

Table 3.2 shows the results of the multiple regression analysis for husband's education by marriage type. Marriage type was significantly correlated with husband's education ($n = 2,858$, $p = .003^1$). When broken down by marriage type, husbands of wives in arranged marriage had significantly less education than those in self-choice marriages ($\beta = -.184$, $p = .002$). Wife's highest level of education and wife's assets were also significantly correlated with husband's highest level of education ($p < .001$ and $p = .001$ respectively). Both showed a positive correlation; women with more assets before marriage ($B = .018$, $p = .001$) married husbands with more assets before marriage and

¹ This p-value (.003) is not found on the tables presented but is instead from the ANOVA comparison which compares the overall effect across the three groups.

women with higher education before marriage ($B=.579$, $p<.001$) married men with more education.

Husband's Assets Before Marriage

Table 3.2 shows the results of the multiple regression analysis for husband's assets by marriage type. Husband's assets before marriage was not significantly correlated with marriage type ($n=2394$, $p = .802^2$). Women's assets before marriage were positively correlated with husband's assets before marriage ($p<.001$) as was wife's highest level of education ($p<.001$), where women with more education were married to men with more assets before marriage.

Table 3.2. Multiple regression analyses showing Husband's Education and Husband's Assets by Marriage Type and controlling for Wife's Education and Wife's Assets.

	Husbands Education			Husbands Assets(log value in rupiah)		
	B	SE	p-value	B	SE	p-value
Intercept	0.984	0.044	<.001	3.179	0.175	<.001
Wife's Education	0.579	0.015	<.001	0.515	0.06	<.001
Wife's Assets(log value in rupiah)	0.018	0.005	0.001	0.145	0.02	<.001
Marriage Type: Ref=Self-Chosen						
Arranged marriage by non-family	0.234	0.207	0.258	0.405	0.823	0.623
Arranged marriage by parents / family	-0.184	0.058	0.002	0.109	0.239	0.649

² This p-value (.802) is not found on the tables presented but is instead from the ANOVA comparison which compares the overall effect across the three groups.

Husband Personality Traits

Table 3.3 shows the results of the multiple regression analysis for husband's personality traits by marriage type and Figure 1 compares means of husband's personality traits by marriage type. Marriage type was not significantly correlated with any of the four husband's personality traits examined (n=2,438); "who does a thorough job," $p = .701$; "original, comes up with new ideas," $p=.570$; "considerate and kind to almost everyone," $p=.951$; "outgoing, sociable," $p = .599$)³. For both the personality trait ("does a thorough job") and the personality trait ("is considerate and kind to everyone") husband's personality trait was significantly correlated with the same personality trait in the wife ($p = .013$ and $p = .003$, respectively). Husband's personality trait ("is outgoing, sociable") was significantly correlated with the trait "is considerate and kind" in wives ($p=.011$), even after controlling for wife's education and assets before marriage and who arranged the marriage. Women's assets before marriage were not significantly correlated with any of the husband's personality traits. On the other hand, women's education level was significantly correlated with husband personality trait, "original, comes up with new ideas" ($p<.001$) and husband personality trait, "outgoing, sociable" ($p=.025$).

³ These p-values ($p=.701$, $p= .570$, $p=.951$, $p =.599$) are not found on the tables presented but are instead from the ANOVA comparison which compares the overall effect across the three groups

Table 3.3. Multiple regression analyses showing Husband's Personality Traits by Marriage Type and controlling for wife's education level, wife's assets and wife's personality traits.

	considerate and original, comes up kind to almost everyone with new ideas outgoing, sociable										
	does a thorough job		everyone		with new ideas		outgoing, sociable				
	B	SE	p-value	B	SE	P-value	B	SE	B	pp-value	
Intercept	3.738	0.119	<.001	3.981	0.115	<.001	3.377	0.158	3.78	0.117	<.001
Wife's Education	0.016	0.014	0.263	0.026	0.013	0.051	0.091	0.018	0.031	0.014	0.02
Wife's Assets (log value in rupiah)	0.001	0.005	0.782	-0.003	0.004	0.45	0.004	0.006	0.005	0.004	0.28
Wife(does a thorough job)	0.061	0.021	0.003	-0.007	0.02	0.733	0.002	0.028	-0.003	0.02	0.88
Wife (considerate & kind to almost everyone)	<.001	0.015	0.988	0.004	0.014	0.776	0.006	0.019	0.001	0.014	0.96
Wife (original, comes up with new ideas)	0.01	0.024	0.676	0.064	0.023	0.005	0.011	0.031	0.06	0.023	0.01
Wife(Outgoing, sociable)	0.017	0.022	0.435	-0.035	0.022	0.102	0.025	0.03	0.018	0.022	0.42
Arranged marriage by non-family	0.113	0.192	0.554	0.038	0.185	0.837	-0.2	0.254	-0.181	0.188	0.33
Arranged marriage by parents / family	0.033	0.054	0.541	0.013	0.052	0.807	-0.052	0.071	-0.017	0.053	0.74
Self-chosen marriage											8

Note: Personality traits were self-rated on a 5-point scale: 1:Disagree strongly, 2:Disagree a little, 3:Neither agree nor disagree, 4:Agree a little, 5:Agree Strongly

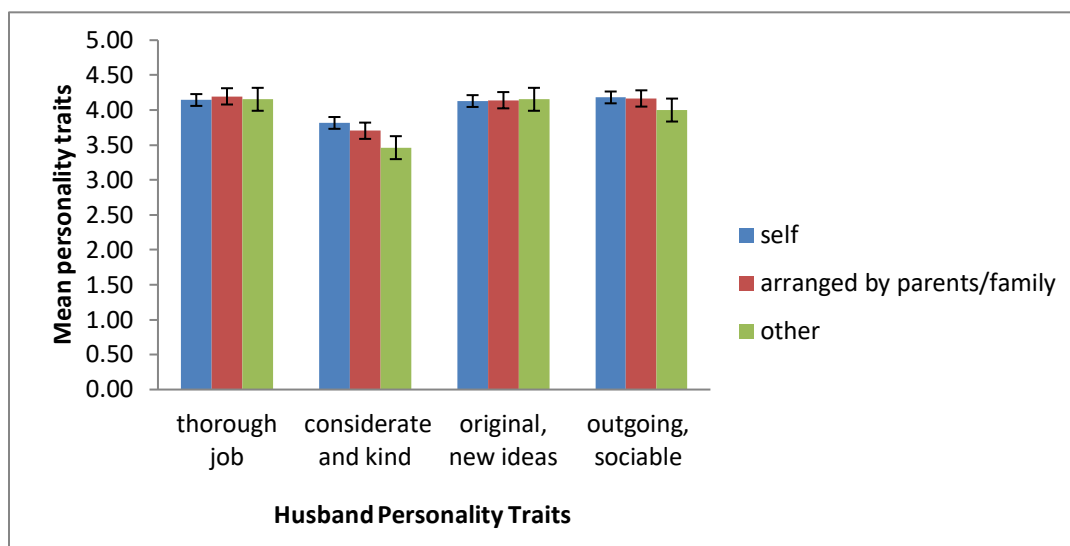


Figure 1. Mean values of personality traits by marriage type

Summary

Using data from the fifth wave of the Indonesian Family Life Survey, I examined the question of whether there was a difference in husband characteristics between women in arranged marriages and those in self-choice marriages. I predicted that husbands of women in arranged marriages will have more assets prior to marriage, and will exhibit the personality traits “does a thorough job” and “is considerate and kind to almost everyone” more than the husbands of women in self-choice marriage. Women in self-choice marriages were predicted to have husbands with a higher education level and exhibit the personality traits “original and comes up with new ideas” and “outgoing, sociable” more than the husbands of women in arranged marriages.

Only the prediction that husbands of women in self-choice marriages would have a higher education level than husbands of women in arranged marriage was met. There were no significant differences between husbands of wives in arranged marriages

compared to husbands of wives in arranged marriages for the other traits examined. Women with more education and assets tended to marry men with more education and women with more education tended to marry men with more assets before marriage. Two of the husband personality traits (“does a thorough job” and “is considerate and kind to everyone”) were significantly correlated with the same personality trait in the wife. Husband’s personality trait (“is outgoing, sociable”) was significantly correlated with trait (“is considerate and kind”) in wives. Women’s assets before marriage were not significantly correlated with any of the husband’s personality traits. On the other hand, women’s education level was significantly correlated with husband personality trait, “original, comes up with new ideas” and husband personality trait, “outgoing, sociable.”

CHAPTER FOUR: QUESTION 2: ARE THERE DIFFERENCES IN PARENTAL INVESTMENT STRATEGIES BETWEEN WOMEN WHOSE FIRST MARRIAGE WAS ARRANGED AND THOSE WHO CHOSE THEIR OWN HUSBANDS?: METHODS AND RESULTS

In this chapter, I describe the methods used to examine the second question, Are there differences in parental investment strategies between women whose first marriage was arranged and those who chose their own husbands? I also present the results of my analyses.

Based on the Reproductive Compensation Hypothesis, I expect to see the following: women in arranged marriages will have more clinic visits than women who chose their own husbands, women in arranged marriages will have babies with higher birthweights than women who chose their own husbands, women in arranged marriages will breastfeed longer than women who chose their own husbands, and women in arranged marriages will have more children per years married than women who chose their own husbands.

Methods

As with the previous chapter, data was used from the fifth wave of the Indonesian Family Life Survey (IFLS) which was collected in 2014. Data on marriage include whether or not the first marriage was arranged and by whom, years married, and data on pregnancy and children include the number of clinic visits, child's birthweight, age child was weaned from breastfeeding and number of live births. Again, as with the previous

chapter, women were only included in the study if they were currently in their first marriage.

For purposes of determining whether the reproductive compensation hypothesis operates in humans, data for the youngest child was examined to avoid issues of non-independence by examining multiple children per mother. Only children under the age of five were included. The IFLS database included the number of clinic visits for each trimester of pregnancy, the number of live births, the baby's weight in kilograms and date of marriage. Total clinic visits were computed by adding together the number of clinic visits for each trimester of pregnancy. In order to calculate the number of live births per years married it was necessary to first determine the number of years married by subtracting the date of marriage from 2015 and then adding one to the result. The number of live births was then divided by the calculated years married.

The control variables examined were mother's education, father's education, father's income, mother's height and weight (used in the birthweight model only) and total number of children. The number of children was calculated by adding together four survey variables: number of biological sons living with you, number of biological daughters living with you, number of sons living elsewhere and number of daughters living elsewhere. Husband's income was log transformed because of the extremely large numbers and positive skew (median =15,700,000 rupiahs, range =0-6,000,000 rupiahs).

A multiple regression model using the IBM SPSS 25 statistical package was used to analyze the data. Marriage type ("Parents/Family," "Self," and "Other") was a categorical variable. Number of clinic visits, birthweight, length of breastfeeding and number of live births per years married were analyzed separately each as dependent

variables. Wife's education, husband's education, and husband's income were control variables in all models. Number of other children was a control variable in all models except live births per years married. In the birthweight model, mother's height and weight were added as control variables. Since 14.4% of the women were still breastfeeding (n= 626) at the time of the survey, a Cox regression model was used to determine the duration of breastfeeding.

Results

The descriptive statistics for the independent, dependent and control variables are included in Table 4. 1.

Table 4.1. Descriptive statistics of variables

Variable	n	mean/%	Sd
Marriage type			
Self-choice	3542	91.76%	
Arranged by parents/family	300	7.77%	
Arranged by non-family	18	0.47%	
Number of prenatal clinic visits	2810	9.84	7.81
Baby's birthweight (kg)	2793	3.11	0.66
Live births per years married	3899	0.18	0.13
Breastfeeding duration			
Women who have ceased bf	1085	63.41%	
Women still bf	626	36.59%	
Number of children	3928	1.19	0.93
Mother's height (cm)	4297	151.88	5.65
Mother's weight (kg)	4291	55.37	11.49

Number of Prenatal Clinic Visits

Table 4.2 shows the results of the multiple regression analysis for prenatal clinic visits by marriage type.

Marriage type was not significantly correlated with number of prenatal clinic visits ($n=1,747$, $p=.975^4$). None of the control variables were significantly correlated with number of prenatal clinic visits (husband's education, $p=.28$; wife's education, $p=0.26$; husband's income, $p=.34$, and number of children, $p=.06$).

Table 4.2. Multiple regression analyses showing Prenatal Clinic Visits by Marriage Type and controlling for Husband's Education, Wife's Education, Husband's Income and Number of Children.

	Prenatal Clinic Visits		
	B	SE	p-value
Intercept	6.09	3.32	0.07
Husband's Education	0.28	0.26	0.28
Wife's Education	0.24	0.26	0.35
Husband's Income	0.46	0.48	0.34
Number of Children	-0.56	0.30	0.06
Self-choice marriage (ref. category)			
Arranged marriage by non-family	0.20	2.71	0.94
Arranged marriage by parents / family	-0.19	0.89	0.83

Birthweight

Table 4.3 shows the results of the multiple regression analysis for birthweight by marriage type.

⁴ This p-value (.975) is not found on the tables presented but is instead from the ANOVA comparison which compares the overall effect across the three groups.

Marriage type was not significantly correlated with child's birthweight (n=1,721, p=.553⁵). Number of children was positively correlated with birthweight (p<0.01) as was mother's height (p=.02) and mother's weight (p=.01).

Table 4.3. Multiple regression analyses showing Birthweight (in kg) by Marriage Type and controlling for Husband's Education, Wife's Education, Husband's Income, Number of Children and Mother's Height and Weight.

	Birthweight (kg)		
	B	SE	p-value
Intercept	1.16	0.53	0.03
Husband's Education	-0.03	0.02	0.24
Wife's Education	0.02	0.02	0.24
Husband's Income	0.05	0.04	0.22
Number of Children	0.13	0.02	<0.01
Mother's height (cm)	0.01	0.00	0.02
Mother's weight (kg)	0.01	0.00	0.01
Self-choice marriage(ref. category)			
Arranged marriage by non-family	0.21	0.23	0.37
Arranged marriage by parents / family	0.05	0.07	0.53

Duration of Breastfeeding

Cox proportional hazard models were run to evaluate the effects of marriage type of breastfeeding duration. Table 4.4 shows the results of this analysis. Marriage type showed no significant risk for increasing or decreasing breastfeeding duration.

Husband's income was significantly associated with duration of breastfeeding, where

⁵ This p-value (.553) is not found on the tables presented but is instead from the ANOVA comparison which compares the overall effect across the three groups.

greater income is associated with shortened duration of breastfeeding (n= 1,689, HR=1.20; 95% CI=1.03-1.41; p=.02). Number of children was also significantly associated with duration of breastfeeding where a greater number of children is associated with a longer duration of breastfeeding (n=1,689, HR=0.88; 95% CI=0.80-0.96; p<0.01).

Table 4.4. Cox regression analysis showing Duration of Breastfeeding by Marriage Type and controlling for Husband's Education, Wife's Education, Husband's Income, and Number of Children.

Predictors of Overall Duration	HR	95% CI		p-value
		lower	Upper	
Self-choice marriage (ref. category)				
Arranged marriage by parents /family	0.80	0.40	1.61	0.53
Arranged marriage by non-family	0.83	0.64	1.07	0.15
Husband's Education	1.08	1.00	1.17	0.06
Wife's Education	0.99	0.91	1.07	0.74
Husband's Income	1.20	1.03	1.41	0.02
Number of Children	0.88	0.80	0.96	<0.01

Number of Births Per Years Married

Table 4.5 shows the results of the multiple regression analysis for live births per years married by marriage type. Marriage type was significantly correlated with live births per years married (n=2,369, p= .028⁶). Women in marriages arranged by parents/family had significantly fewer children than those in self-choice marriages ($\beta = -0.02$, p =0.02). None of the control variables were significantly correlated with number of live

⁶ This p-value (.028) is not found on the tables presented but is instead from the ANOVA comparison which compares the overall effect across the three groups.

births per years married (husband's education, $p = .41$; wife's education, $p = 0.33$; husband's income, $p = .22$).

Table 4.5 Multiple regression analyses showing Live births per years married by Marriage Type and controlling for Husband's Education, Wife's Education, and Husband's Income.

	Live births per years married		
	B	SE	p-value
Intercept	0.13	0.04	<0.01
Husband's Education	0.00	0.00	0.41
Wife's Education	0.00	0.00	0.33
Husband's Income	0.01	0.01	0.22
Arranged marriage by non-family	-0.05	0.03	0.17
Arranged marriage by parents / family	-0.02	0.01	0.02
Self-choice marriage (ref. category)			

Summary

Based on the Reproductive Compensation Hypothesis, which proposes that parents will invest more in their offspring when mate choice is constrained, I predicted that women in arranged marriages will have more clinic visits than women who chose their own husbands, women in arranged marriages will have babies with higher birthweights than women who chose their own husbands, women in arranged marriages will breastfeed longer than women who chose their own husbands, and women in arranged marriages will have more children per years married than women who chose their own husbands.

Marriage type (self-choice or arranged) was not significantly correlated with number of prenatal clinic visits, child's birthweight, and duration of breastfeeding. Marriage type was significantly correlated with live births per years married, however, not in the predicted direction. Women in marriages arranged by parents/ family had significantly fewer children than those in self-choice marriages. The control variables, number of children, mother's height and mother's weight, were positively correlated with birthweight. The control variable, husband's income, was associated with shortened duration of breastfeeding, but number of children was associated with a longer duration of breastfeeding. None of the control variables were significantly correlated with number of prenatal clinic visits or live births per years married.

CHAPTER 5: DISCUSSION AND FUTURE STUDIES

Discussion

Arranged Marriage Vs. Self-Choice Marriage

Although a number of studies have found differences in traits that children prefer in a mate versus those preferred by parents, with the exception of the husband's education level, this study did not show significant differences in husband's traits in marriages where women choose their own mates and marriages which were arranged by parents or other family. It had been predicted that women in arranged marriages would have husbands with more assets prior to marriage and exhibit the personality traits "does a thorough job" and "is considerate and kind to almost everyone" more than the husbands of women in self-choice marriage. These were all traits that I predicted parents would prefer for in-laws. However, none of these traits were significantly correlated with the type of marriage. I had also predicted that women who chose their own partners would have husbands with a higher education level and would exhibit the personality traits "original and comes up with new ideas" and "outgoing, sociable" more than the husbands of women whose spouses were chosen for them. Women who chose their own spouses did choose mates with significantly higher education levels than mates of women in arranged marriages but not the personality traits expected.

There are a number of reasons why, with the exception of husband's education level, no differences were found in mate characteristics between the husbands of women in self-choice marriages and those in arranged marriages. One possibility is that although

parents and children differ in what they say they prefer in a mate, when it comes down to actually choosing a mate, parents and children share the same preferences. Children may also say they prefer certain traits but actually choose mates that are more in line with parental expectations in this context. However, in a study on self-reported mate preferences in 37 cultures, Buss (1989) checked the data he collected on mate preferences for age to see if they were carried over into actual mating decisions. He compared his results for the variables “preferred age at marriage”, “preferred spouse age” and “preferred age difference” with data in the United Nations Demographic Yearbook (1988). The stated preference for each variable was validated by the demographic data for each country which indicated to Buss that stated mate preferences are mirrored in actual mate selection.

Assortative mating has also been found to be a factor in human mate choice. In a study of twins, Zietsch and colleagues (2011) found that although family environmental factors were significant factors in the age and income of females’ mates, the most apparent mate choice pattern was that of assortative mating which was found for education, social attitudes, religiosity and age. In addition, partner similarity was partially due to phenotype matching. Another study examined a sample of newlyweds (Watson et al., 2004) and found that couples displayed strong similarity in age, religiosity and political orientation with moderate similarity in education and intelligence. However, little similarity between partners was found for self- and spouse-rate personality traits. The authors suggest that stronger preferences such as similar religion and political views are judged to be the most important with other traits such as personality less important. In my current study 99.3% out of 3,504 husband-wife pairs

were of the same religion which suggests that regardless of marriage type, belonging to the same religion was an important factor in mate selection. In a study of mate preferences in 33 cultures, Buss and colleagues (1990) found that similar religious orientation was the most valued mate preference. My results also showed that women with more assets before marriage married husbands with more assets before marriage and women with more education before marriage married men with more education. Both of these results seem to indicate that there is some level of assortative mating occurring in Indonesia.

Another possibility is that characteristics that might be different between parents and children could not be measured in this data set. For example, previous research has shown that children consider physical attractiveness a more desirable trait in a mate than do their parents ((Apostolou, 2008; Apostolou, 2011; Buunk et al., 2008; Buunk and Solano, 2010; Dubbs and Buunk, 2010; Dubbs et al., 2013; Bovet et al., 2018; Perilloux et al., 2011). Another trait that previous studies found children preferred more in a mate than their parents was an “exciting personality” (Buunk et al., 2008; Dubbs and Buunk, 2010; Dubbs et al., 2013; Perilloux et al., 2011; Apostolou, 2011). None of the studies, however, has defined what constitutes an “exciting personality.” In the current study, the trait “outgoing, sociable” stood in for an “exciting personality.” However, they may not be equivalent traits. In addition, the personality traits reported in this study were self-reported by the husband and may not reflect the perception of others.

While some previous studies have focused on differences in what people prefer in a mate, the similarities may be more important than the differences. For example Buss and colleagues (1990) examined mate preferences cross-culturally and found some

differences across gender, but both men and women chose *mutual attraction-love* as their top characteristic in a mate. The same may be true in this case. Although previous studies have focused on the differences between parents and children in mate choice, it is possible that their similarities outweigh their differences.

Without performing similar studies in other groups with arranged marriage, it is difficult to know whether or not the results of this study are unique to this cultural context. In a study of mate preferences in 37 cultures, Buss and colleagues (1990) found that across all groups studied, culture accounted for 14% of the variation in preferences. It is possible then, that a study similar to mine may have different results if conducted in a different cultural context.

Two variables not examined in this study were bride-wealth and dowry customs which are practiced among a number of Indonesia groups (Puspitorini et al., 2017; Schrauwers, 2000; Lon and Widyawati, 2018). It is possible that one or both of these practices may also affect mate selection. For instance, women with more education may command a higher bride-wealth price (Lon and Widyawati, 2018). A high bride-wealth price may limit the number of potential mates, particularly if the woman's father will not compromise. In some cases, according to Lon and Widyawati (2018), a woman may have a preferred suitor but because he cannot pay the asked for bride-wealth, the suitor is rejected by her father and she must settle for a less-preferred mate.

As discussed earlier in this paper, arranged marriage is becoming less common in Indonesia. Although more young people are choosing their own spouses, parental approval is still extremely important (Malhorta, 1991) and parental wishes still strongly influence mate choice (Nilan, 2008; Buttenheim and Nobles, 2009; Jones, 2005). It may

be that women in this study who chose their own mates, compromised on traits in order to gain parental approval for the marriage. It is also possible that the parent or family members who arranged marriage in this study did not completely impose their will on their daughters and instead gave them some say in their future spouse. This is common in India, for example.

Another limitation of this study is that for the IFLS question, “Who chose your husband (from your first marriage)?” there was no scale for the responses. The choices were “parents,” “self,” “family” and “other.” However, it is difficult to know exactly what is meant by each option as there are variations in both arranged marriage and self-choice marriage. For example, in the Asian Marriage Survey (1979-1980) respondents were asked whether the spouse for their first marriage was (1) totally initiated and arranged by the parents, (2) initiated and arranged by parents with the respondent’s approval, (3) initiated and chosen by respondent with parental approval, or (4) totally initiated and chosen by the respondent (Malhorta, 1991). Options (2) and (3) fall into a somewhat shady area, i.e., neither type of marriage is completely arranged or completely self-choice. It is possible that IFLS respondents did not all perceived the options “parents,” “self,” “family” and “other” in the same way. Some respondents may have considered a marriage in which their parents chose several appropriate partners but allowed them to select one of these partners an arranged marriage. Other respondents may have considered similar circumstances (choosing a partner from among several selected by their parents) as a self-choice marriage.

The Reproductive Compensation Hypothesis

Although a number of studies in non-human species have found that parents will increase their parental investment in order to compensate for lower-quality mates, this study did not show significant differences in investment strategies between women in arranged marriages and women in self-choice marriages. It had been predicted that women in arranged marriages would invest more in their offspring and so would have more clinic visits, babies with higher birthweights, breastfeed for a longer duration and have more children per years married than women who chose their own husbands. The only significant correlation was found between marriage type and number of children. In this case, the result was in the opposite direction than had been predicted. Women in marriages arranged by parents/family had significantly fewer children than in self-choice marriages.

Based on this first part of this study, it is possible that, at least in this group, that arranged marriage is not a form of mate coercion or that partners in arranged marriages are not of a lower quality. Although parents and children indicated they preferred different traits in the child's partner, this research did not find significant differences in traits between the husbands of women in arranged marriages versus the traits of husbands in self-choice marriage. Parental approval of a partner is still important to young Indonesians when choosing a mate. It may be that even when parents or other family members arrange a marriage for a daughter, the daughter has some say in the matter as the parents may be unwilling to force a mate upon their daughter that she does not like.

The finding that women in marriages arranged by parents/family had significantly fewer children than women in self-choice marriages was unexpected. Possibly there are

some subtle incompatibilities between spouses in arranged marriages that this study did not detect that result in decreased sexual activity, lack of desire for more children or genetic incompatibility that results in decreased likelihood of conception or increased rate of miscarriage. One study examining marital satisfaction of 456 heterosexual couples in Turkey found that marital satisfaction was higher in self-choice marriages than in arranged marriages. Husbands and wives reported “greater love” in self-choice marriages than in arranged marriages (Imamoğlu et al., 2019). It is also possible that couples in “self-choice” marriages conceived their first offspring prior to their marriage, resulting in greater offspring/year than couples in arranged marriage, who may be less likely to engage in sexual relations prior to marriage.

Another explanation for failing to see the predicted results is that the variables used to measure parental investment were not specific enough and did not capture meaningful differences. Birthweight is one such measure. This study only looked at mean differences in birthweight between groups but did not examine if there were differences in the number of low birth-weight and normal birthweight infants between marriage types. Breastfeeding duration is another variable in which the duration after a certain number of months may not be as important as whether or not the mother exclusively breastfeeds for 6 months and then continues to breastfeed up to at least two years of age per UNICEF and WHO guidelines.

I also considered the possibility that the differential allocation hypothesis (DAH) may explain investment patterns better than the reproductive compensation hypothesis. The DAH suggests that individuals mated to partners with high genetic quality will invest more in their offspring than individuals mated to a lower quality partner (Bolund et al.,

2008; Burley, 1988). With the exception of the finding that women in arranged marriages had significantly fewer children than in those in self-choice marriages, the results of this study do not seem overall, to support the DAH. The DAH may explain why women in self-choice marriages have more children, but as discussed earlier, the results of the first part of my study did not show that husbands in self-choice marriage were of a “higher genetic quality” than those in arranged marriage.

Parental investment in humans is also complicated by the fact that humans are cooperative breeders. Not only do human mothers rely on help from mates in caring for offspring, they may also rely on help from alloparents such as older children, grandparents, other kin and sometimes non-related individuals. In callitrichines (small New World primates), also highly cooperative breeders, mothers who do not receive adequate allomaternal assistance will often kill or abandon their newborns (Hrdy, 2016). Although human mothers may not often resort to such extremes, the amount of help mothers receive from alloparents, particularly with newborns, may affect mothers’ parental investment (Hrdy, 2016). Many Indonesian couples do reside with in-laws (Buttenheim and Nobles, 2009) which may also affect the amount of alloparent help available.

Another possibility that could complicate my predictions is that arranged marriage itself may be a form of parental investment. Parents do not automatically cease investing in their children once they become adults. On the contrary, parents provide financial, household and other help to not only adult children, but grandchildren and have been found to preferentially invest in those with the most need (Snopkowski and Sear, 2015). It makes sense then, that parents would prefer mates for their children that will invest in

future grandchildren. Mates that are able to provide for parents' adult children and grandchildren may decrease the amount of investment that parents must make in their adult children and grandchildren. High-investing mates will also enhance the grandparents' inclusive fitness by ensuring the fitness of grandchildren.

Future Studies

Arranged Marriage Vs. Self-Choice Marriage

Mate characteristics could be studied in arranged vs. non-arranged marriages in other regions of the world to see whether there is a difference in mate characteristics between the two groups. Ideally such a study would include asking the spouses to rate their partners on such characteristics as physical attractiveness and personality traits. Another important factor would be to determine the level of parental influence on mate choice as this may affect the differences in mate characteristics. As discussed earlier, Malhorta (1991) examined four levels of parental involvement in mate choice. The extremes were that the parents had complete control over mate selection or were not involved at all. Comparing these two extremes, and if there is a conflict between children and parents over mate selection, it would be predicted there would be a difference in mate characteristics. However, it is less clear whether there would be a difference in mate characteristics of partners in marriages that were initiated and arranged by parents with the individual's approval, and partners in marriages that were initiated and chosen by the individual with parental approval. Defining the relative amounts of parental involvement and individual choice in both marriages defined as "arranged" and those defined as "free choice" would be extremely helpful in determining whether or not there is truly a difference between mate characteristics in these two forms of marriage. It may

also help determine the level of conflict and compromise that exists between parents and their children in selecting mates.

The Reproductive Compensation Hypothesis

One of the major challenges is determining whether the Reproductive Compensation Hypothesis operates in humans is finding circumstances under which mate choice is truly constrained. One such circumstance might be marriages in which parents have complete or almost complete control over mate selection for their children with little to no input from their children. Another constraint on mating might be when partners are forced to settle for lower quality mates due to their own low quality. This could occur when one or both partners have traits such as very little education, low income or little wealth, lack social status or have undesirable personality/psychological characteristics, all traits that may signal genetic quality or poor prospect for parental investment, and make them less desirable as a mate. Both of these constraints on mating could have an effect on offspring quality and are possibilities for testing the Reproductive Compensation Hypothesis.

The variables used in this study to measure parental investment could be fine-tuned. As mentioned earlier, it would be helpful to examine the differences in rates of normal-birthweight and low-birthweight babies between women in self-choice marriages and those in constrained marriages. If possible, it would be useful to determine if there is a difference in how long babies are exclusively breastfed between women in the two types of marriages. Other measures of parental investment that could be examined include number of well-child clinic visits during the first 1-2 years of life, child's growth and development and schooling.

Summary

The Reproductive Compensation Hypothesis proposes that individuals who mate under constraint will increase their reproductive effort and investment in offspring to compensate for lowered offspring viability. One constraint on mate choice in humans may be arranged marriage in which parents or others choose a mate for an individual. A number of studies have found differences in traits that children prefer in a mate versus those preferred by parent. This study, using data from the Indonesian Family Life Survey, examined whether there was a difference in characteristics between husbands of women in arranged marriage compared to husbands of women in self-choice marriages. In addition, this study examined whether there were differences in parental investment of women in arranged marriages compared to women in self-choice marriages. With the exception of the husband's education level, this study did not show significant differences in husband's traits in marriages where women choose their own mates compared to women in arranged marriages. Marriage type was not significantly correlated with parental investment measures except for live births per years married. This correlation was not, however, in the predicted direction.

It is possible that arranged marriage is not a true constraint on mate choice or that parental investment measures used in this study need to be more refined. Future studies could examine arranged marriages in other regions of the world to determine if there is a difference between traits in partners in arranged marriage compared to self-choice marriage. Other measures that could be used to examine parental investment include number of well-child clinic visits during the first 1-2 years of life, and years of schooling.

Further research on both of these topics will add to the interesting and important literature on mate choice and parental investment.

REFERENCES

- Adair, Linda S., and David K. Guilkey. 1997. "Age-Specific Determinants of Stunting in Filipino Children." *The Journal of Nutrition* 127(2): 314–320.
- Anderson, Wyatt W., Young-Kyu, Kim and Patricia Adair Gowaty. 2007. "Experimental Constraints on Mate Preferences in *Drosophila pseudoobscura* Decrease Offspring Viability and Fitness of Mated Pairs." *Proceedings of the National Academy of Sciences* 104(11): 4484–4488.
- Apostolou, Menelaos. 2007. "Sexual Selection under Parental Choice: the Role of Parents in the Evolution of Human Mating." *Evolution and Human Behavior* 28: 403–409.
- Apostolou, M. 2008. "Parent–offspring Conflict over Mating: The Case of Beauty." *Evolutionary Psychology*, 6: 303–315.
- Apostolou, Menelaos . 2011. "Parent-Offspring Conflict over Mating: Testing the Tradeoffs Hypothesis." *Evolutionary Psychology* 9(4): 470-495.
- Apostolou, Menelaos. 2014a. "Sexual Selection in Ancestral Human Societies: The Importance of the Anthropological and Historical Records." *Evolutionary Behavioral Sciences* 8 (2): 86–95.
- Apostolou, Menelaos. 2014b. "Sexual Selection under Parental Choice: A Revision to the Model." *Evolutionary Behavioral Sciences* 8 (2): 86–95.
- Apostolou, Menelaos. 2017. "The Nature of Parent-Offspring Conflict over Mating: from Differences in Genetic Relatedness to Disagreement over Mate Choice." *Evolutionary Psychological Science* 3:62–71.
- Batabyal, Amitrajeet A. 2001. "On the Likelihood of Finding the Right Partner in an Arranged Marriage." *Journal of Socio-Economics*, 33: 273-280.

- Bluhm, Cynthia K., and Gowaty, Patricia Adair. 2004. "Social Constraints on Female Mate Preferences in Mallards, *Anas platyrhynchos*, Decrease Offspring Viability and Mother Productivity." *Animal Behaviour* 68: 977–983.
- Bolund, Elisabeth, Schielzeth, Holger, and Wolfgang Forstmeier. 2009. "Compensatory Investment in Zebra Finches: Females Lay Larger Eggs when Paired to Sexually Unattractive Males." *Proceedings. Biological sciences*, 276(1657): 707–715.
- Bovet, Jeanne, Raiber, Eva, Ren, Weiwei, Wang, Charlotte, & Seabright, Paul. 2018. "Parent–offspring Conflict over Mate Choice: An Experimental Study in China." *British Journal of Psychology* 109: 674–693.
- Burley, Nancy. 1986. "Sexual Selection for Aesthetic Traits in Species with Biparental Care." *The American Naturalist* 127(4): 415–445.
- Burley, Nancy 1988. "The Differential-Allocation Hypothesis: An Experimental Test." *The American Naturalist* 132(5): 611–628.
- Buss, David M. 1989. "Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures." *Behavioral and Brain Sciences* 12 (1): 1–14.
- Buss, David. M., Abbott, M., Angleitner, Alois, Asherian, Armen, Biaggio, Angela., Blanco-Villasenor, Angel., ... Yang, Kuo-Shu. (1990). "International Preferences in Selecting Mates: A Study of 37 Cultures." *Journal of Cross-Cultural Psychology* 21(1):5–47.
- Buttenheim, Alison M., and Jenna Nobles. 2009. "Ethnic Diversity, Traditional Norms, and Marriage Behavior in Indonesia." *Population Studies* 63(3): 277–294.
- Buunk, Abraham P., Park, Justin. H., and Dubbs, Shelli L. 2008. "Parent-Offspring Conflict in Mate Preferences." *Review of General Psychology*, 12: 47–62.
- Buunk, Abraham P. and Alejandro Castro Solano. 2010. "Conflicting Preferences of Parents and Offspring over Criteria for a Mate: A Study in Argentina." *Journal of Family Psychology* 2010, Vol. 24, No. 4, 391–399
- Buunk, Abraham P., Park, Justin. H., & Duncan, Lesley, A. 2010. "Cultural Variation in Parental Influence on Mate Choice." *Cross-Cultural Research* 44: 23–40.

- Byers, John A. and Lisette Waits. 2006. "Good Genes Sexual Selection in Nature." *Proceedings of the National Academy of Sciences* 103 (44): 16343-16345.
- Central Intelligence Agency. (2020). Indonesia. *In The World Factbook*. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/br.html>
- Clutton-Brock, Tim and Katherine McAuliffe. 2009. "Female Mate Choice in Mammals." *The Quarterly Review of Biology* 84 (1): 3-27.
- Drickamer, L. C., Gowaty, P. A. & Holmes, C. M. 2000. "Free Female Mate Choice in House Mice Affects Reproductive Success and Offspring Viability and Performance." *Animal Behaviour* 59:371-378.
- Dubbs, Shelli. L., Buunk, Abraham P., and Hirokazu Taniguchi. 2013. "Parent-Offspring Conflict in Japan and Parental Influence Across Six Cultures." *Japanese Psychological Research*, 55(3): 241-253.
- Dubbs, Shelli. L., and Buunk, Abraham.P. 2010. "Sex Differences in Parental Preferences over a Child's Mate Choice: A Daughter's Perspective." *Journal of Social and Personal Relationships*, 27(8) 1051-1059.
- Fauk, Cahaya IB, Merry MS, Damayani AD, Liana DS. 2017. "Exploring Determinants Influencing the Utilisation of Antenatal Care in Indonesia: A Narrative Systematic Review." *Journal of Health Communication* 2 (4):69.
- Frankenberg, Elizabeth and Duncan Thomas. 2001. "Women's Health and Pregnancy Outcomes: Do Services Make a Difference?" *Demography* 38(2):253-265.
- Fugère, M. A., Chabot, C., Doucette, K., & Cousins, A. J. 2017a. "The importance of physical attractiveness to the mate choices of women and their mothers." *Evolutionary Psychological Science*, 3(3), 243- 252.
- Fugère , Madeleine A, Doucette, Kaitlyn, Chabot, Caitlyn and Alita j. Cousins. 2017b. "Similarities and differences in mate preferences among parents and their adult children." *Personality and Individual Differences*, 111(80-85).
- Fugère , Madeleine A., Madden, Stephanie and Alita J. Cousins. 2019. "The Relative Importance of Physical Attractiveness and Personality Characteristics to the Mate

- Choices of Women and Their Fathers.” *Evolutionary Psychological Science* 5:394–404.
- Gangestad, S. W., & Simpson, J. A. 2000. “The evolution of human mating: trade-offs and strategic pluralism.” *Behavioral and Brain Sciences*, 23, 573–644.
- Jones, Gavin W. 1977. “Fertility Levels and Trends in Indonesia.” *Population Studies*, 31(1) 29-41.
- Goncalves, Ines Braga, Mobley, Kenyon B, Ahnesjo, Ingrid, Sagebakken, Gry, Jones, Adam G. and Charlotta Kvarnemo. 2010. “Reproductive Compensation in Broad-nosed Pipefish Females.” *Proceedings of the Royal Society B* 277: 1581–1587.
- Gowaty, Patricia Adair, Anderson, Wyatt W., Bluhm, Cynthia K., Drickamer, Lee C., Kim, Yong-Kyu, and Allen J. Moore. 2007. “The Hypothesis of Reproductive Compensation and its Assumptions About Mate Preferences and Offspring Viability.” *Proceedings of the National Academy of Sciences* 104(38):15023–15027.
- Gowaty, Patricia Adair. 2008. “Reproductive Compensation.” *Journal of Evolutionary Biology* 21:1189-1200.
- Harris, W. E. & Uller, Tobias. 2009. “Reproductive Investment When Mate Quality Varies: Differential Allocation versus Reproductive Compensation.” *Philosophical Transactions of the Royal Society of London: Biological Sciences* 364 (1520): 1039-1048.
- Hatton Timothy J., Sparrow, Robert, Suryadarma, Daniel, and Pierre van der Eng. 2018. “Fertility and the health of children in Indonesia.” *Economics & Human Biology* 28: Pages 67-78.
- Heaton, Tim B., Cammack, Mark and Larry Young. 2001. “Why is the Divorce Rate Declining in Indonesia?” *Journal of Marriage and Family*, 63(2): 480-490.
- Howell, Signe. 2016. “Battle of Cosmologies: The Catholic Church, *Adat*, and ‘Inculturation’ among Northern Lio, Indonesia.” *Social Analysis*, 60(4): 21-39.

- Hrdy, Sarah. 2016. "Of Marmosets, Men, and the Transformative Power of Babies." In *Costly and Cute: Helpless Infants and Human Evolution*, edited by Wenda R. Trevathen and Karen R. Rosenberg, 177-203, Albuquerque: School for Advanced Research and University of New Mexico Press.
- Ihle, Malika, Kempnaers, Bart, and Wolfgang Forstmeier. 2015. "Fitness Benefits of Mate Choice for Compatibility in a Socially Monogamous Species." *PLoS Biology* 13(9): 1-21.
- Imamoğlu, E. Olcay, Ads, Menatalla, and Carol C. Weisfeld. 2019. "What Is the Impact of Choosing One's Spouse on Marital Satisfaction of Wives and Husbands? The Case of Arranged and Self-Choice Turkish Marriages." *Journal of Family Issues* 40(10): 1270–1298.
- Indriyati, Indriyati and Dwini Handayani. 2018. "Teen Marriage and Feeding Behaviour to Children in Indonesia." *Malaysian Journal of Economic Studies* 55 (2): 151-166.
- Jones, Gavin W. 1977. "Fertility Levels and Trends in Indonesia." *Population Studies*, 31(1) 29-41.
- Jones, Gavin W. 2001. "Which Indonesia Women Marry Youngest and Why?" *Journal of Southeast Asian Studies*, 32(1): 67-78.
- Jones, Gavin W. 2005. "The Flight from Marriage in South-East and East Asia." *Journal of Comparative Family Studies*, 36(1): 93-119.
- Katz, June S., and Ronald S. Katz. 1975. "The New Indonesian Marriage Law. A Mirror of Indonesia's Political, Cultural, and Legal Systems." *The American Journal of Comparative Law* 23(4):653-81.
- Kurniati, Anna & Chen, Ching-Min & Efendi, Ferry & Berliana, Sarni. 2017. "Factors Influencing Indonesian Women's Use of Maternal Health Care Services." *Health Care for Women International* 39. 00-00.
- Lon, Yohanes Servatius and Fransiska Widyawati. 2018. "Bride-Wealth: Is There Respect for Women in Manggarai, Eastern Indonesia?" *Humaniora* 30(3): 271–278.

- Malhorta, Anju. 1991. "Gender and Changing Generational Relations: Spouse Choice in Indonesia." *Demography*, 28(4): 549-570.
- Michl, Gábor, Török, János, Péczel, Péter, Garamszegi, László Z., and Hubert Schwabl. 2005. "Female Collared Flycatchers Adjust Yolk Testosterone to Male Age, but not to Attractiveness." *Behavioral Ecology* 16 (2): 383–388.
- Morris, Molly R., Rios-Cardenas, Oscar and M. Scarlett Tudor. 2006. "Larger Swordtail Females Prefer Asymmetrical Males." *Biology Letters* 2: 8–11.
- Murdock, G. P. 1981. *Atlas of World Cultures*. Pittsburgh, PA: University of Pittsburgh Press.
- Navara, Kristen.J., Hill, Geoffrey.E. and Mary.T Mendonça. 2006. "Yolk Androgen Deposition as a Compensatory Strategy." *Behavioral Ecology and Sociobiology* 60: 392–398.
- Nilan, Pam. 2008. "Youth Transitions to Urban, Middle-class Marriage in Indonesia: Faith, Family and Finances." *Journal of Youth Studies*, 11 (1): 65-82.
- Nobles, Jenna and Alison Bутtenheim. 2008. "Marriage and Socioeconomic Change in Contemporary Indonesia." *Journal Marriage Family*, 70(4): 904-918.
- Nguyen, Giang. 2019. "Sibling-sex Composition, Childbearing and Female Labour Market Outcomes in Indonesia." *Journal of Population Research* 36:13–34.
- Platt, Maria (2012). "It's already gone too far': Women and the Transition into Marriage in Lombok, Indonesia." *The Asia Pacific Journal of Anthropology*, 13(1): 76-90.
- Perilloux, C., Fleischman, D. S., & Buss, D. M. 2011. "Meet the Parents: Parent-offspring Convergence and Divergence in Mate Preferences." *Personality and Individual Differences* 50:253–258.
- Price, D.H. 1989. *Atlas of World Cultures*. Caldwell, NJ: The Blackburn Press.
- Puspitorini et al. 2017
- Pryke, Sarah R. and Simon C. Griffith. 2009. "Maternal Adjustment of Parental Effort in Relation to Mate Compatibility Affects Offspring Development." *Behavioral Ecology* 21 (2):226-232.

- Puspitorini, Arita, Soeyono, Rahayu Dewi, and Mutimmatul Faidah. "The Form and the Meaning of Bridal Dowry in Indonesia." *Advances in Social Science, Education and Humanities Research (ASSEHR)* 112: 249-252.
- Qibthiyah, Riatu, and Ariane J. Utomo. 2016. "Family Matters: Demographic Change and Social Spending in Indonesia." *Bulletin of Indonesian Economic Studies* 52(2):133-159
- Reynolds, J. D. & Gross, M. R. 1992. "Female Mate Preference Enhances Offspring Growth and Reproduction in a Fish, *Poecilia reticulata*." *Proceedings of the Royal Society of London, Series B* 250: 57–62.
- Rumble, Lauren, Peterman, Amber, Irdiana, Nadira, Triyana, Margaret, and Emilie Minnick. 2018. "An Empirical Exploration of Female Child Marriage Determinants in Indonesia." *BMC Public Health*, 18:407-419.
- Schrauwers, Albert. 2000. "Three Weddings and a Performance: Marriage, Households, and Development in the Highlands of Central Sulawesi, Indonesia." *American Ethnologist* 27 (4):855-876.
- Sheldon, Ben C. 2000. "Differential Allocation: Tests, Mechanisms and Implications." *Trends in Ecology and Evolution*. 15 (10):397-402.
- Smith-Hefner, Nancy J. 2005. "The New Muslim Romance: Changing Patterns of Courtship and Marriage Among Educated Javanese Youth." *Journal of Southeast Asian Studies*, 36(3): 441-459.
- Snopkowski, Kristin and Rebecca Sear. 2015. "Grandparental Help in Indonesia is Directed Preferentially Towards Needier Descendants: a Potential Confounder when Exploring Grandparental Influences on Child Health." *Social Science and Medicine* 128:105-114.
- Strauss, John, Witoelar, Firman and Bondan. Sikoki. 2016. "The Fifth Wave of the Indonesia Family Life Survey (IFLS5): Overview and Field Report". WR-1143/1-NIA/NICHD.

- Trisnantoro, L., Soemantri, S., Singgih, B., Pritasari, K., Mulati, E., Agung, F. H., and Weber, M. W. 2010. "Reducing Child Mortality in Indonesia." *Bulletin of the World Health Organization*, 88(9): 642.
- Trivers, Robert L. 1972. "Parental Investment and Sexual Selection." In *Sexual Selection and the Descent of Man*, edited by B. Campbell 1871-1971, 136-179. Aldine-Atherton, Chicago.
- Trivers, Robert. 1974. "Parent-Offspring Conflict." *American Zoologist*, 14(1): 249-264.
- United Nations Demographic Yearbook 1988*. UN, New York,
<https://doi.org/10.18356/03058068-en-fr>
- United Nations Development Programme. 2014. "Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience." New York: hdr.undp.org/sites/default/files/hdr14-report-en-1.pdf.
- Utomo, Ariane and Peter McDonald. 2016. "Who Marries Whom? Ethnicity and Marriage Pairing Patterns in Indonesia." *Asian Population Studies*, 12(1) 28-49.
- van den Berg, Pieter, Fawcett, Tim W., Buunk, Abraham P., and Franz J. Weissing. 2013. "The Evolution of Parent-offspring Conflict over Mate Choice." *Evolution and Human Behavior* 34: 405-411.
- Watson, David, Klohnen, Eva, Casillas, Alex, Simms, Ericka, Haig, Jeffrey and Berry, Diane. 2004. "Match Makers and Deal Breakers: Analyses of Assortative Mating in Newlywed Couples." *Journal of Personality*. 72: 1029-68. 10.1111/j.0022-3506.2004.00289.x.
- Williams, Lindy B. 1990. "Marriage and Decision-Making: Inter-generational Dynamics in Indonesia." *Journal of Comparative Family Studies*, 21(1): 55-66.
- World Health Organization. 2020. "Infant and young child feeding."
<https://www.who.int/news-room/fact-sheets/detail/infant-and-young-child-feeding>
- World Population Review. 2020. Indonesia. <http://worldpopulationreview.com/>

Zietsch, Brendan P., Verweij, Karin J. H., Heath, Andrew C. and Nicholas G. Martin.

2011. "Variation in Human Mate Choice: Simultaneously Investigating Heritability, Parental Influence, Sexual Imprinting, and Assortative Mating." *The American Naturalist* 177(5): 605-616.