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Historical and hunter-gatherer perspectives on fast-slow life history strategies

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ABSTRACT

While there are many possible applications of psychology to human life history strategies, a common hypothesis is the adoption of "fast" life history strategies in response to psychosocial cues of harsh and/or unpredictable environments. This hypothesis has relied almost entirely upon data from industrialized and developed (i.e., modernized) societies. To further explore the evolutionary validity of this hypothesis, I examine data from historical and hunter-gatherer sources. These data show that past incidents and cues of mortality were highly prevalent, direct, and often interrelated, and that caloric limitations and inter-intrasexual competition placed constraints on the use of fast life strategies in response to challenging environments. In both hunter-gatherer and historic populations, harsher and more unpredictable conditions led to a "slow" life history strategy where: a) growth and menarche/spermarche were delayed, b) reproduction was delayed due to energetic constraints and behavioral choices; c) overall fertility was reduced due to energetic constraints and behavioral choices; d) direct parental invest was as high as local energetics would permit. The reverse was found for wealthy/high status individuals who translated their more benign living conditions into earlier sexual maturity and growth, earlier reproduction, greater total reproduction, and the co-opting of paid or slave labor to provide alloparental care for their larger pool of offspring. Thus, past data support the opposite pattern of fast-slow life history strategies as what is seen in modernized environments.

1. Introduction

In studying human life history, psychologists have focused on diverse array of adaptive trade-offs, such as displaying prosocial or antisocial traits, whether to invest a lot in a few children or invest a little in many children, or whether to value the present or the future (Bowlby, 1979; Del Giudice, 2020; Frankenhuis, Young, & Ellis, 2020; Nettle & Frankenhuis, 2019, 2020; Pepper & Nettle, 2017). An assumption underlying some of the psychological research on life history strategies is that these trade-offs can be arrayed along a single continuum, a continuum of *fast* versus *slow* life history (Figueredo, de Baca, & Woodley, 2013). While a person's place on this continuum might be partly heritable, the focus of most research is on how the mind uses *experience* to calibrate whether a person is fast or slow. This research tests what is called the psychosocial acceleration hypothesis (Ellis, 2004). According to this hypothesis, when parents have little or no ability to "enhance the health, competitiveness, and eventual reproductive success of their offspring", evolution should bias them "toward reproducing early and often" (Ellis, 2004, p. 933). Humans become "fast" when they experience harsh or unpredictable environments as children, which causes them to mature quicker sexually, have more children, invest less in those children, and be overall more reckless; in part, this is because they have received signals that they may die prior to reproduction (Belsky, Steinberg, & Draper, 1991). Being "slow" is then the opposite of this pattern. But is this assumption of accelerating life history in response to psychological cues of harsh and unforgiving environments an accurate representation of evolved strategies (Sear, 2020)?

A meta-analysis of data from modernized (i.e., industrialized and developed) societies showed a small, but significant, trend such that people matured sexually, or had their first birth, earlier when exposed to harsh or unpredictable environments (measured as parental absence and low SES) (Xu, Norton, & Rahman, 2018). While supportive of the psychosocial acceleration hypothesis, modernized societies are obviously different from the societies humans lived within during most of our evolution (Pinker, 2018; Volk & Atkinson, 2013). Data from a closer analogue—extant small-scale societies—has found no support for the acceleration hypothesis (Hochberg, Gawlik, & Walker, 2011; Karapanou & Papadimitriou, 2010; Šaffa, Kubicka, Hromada, & Kramer, 2019; Sear,

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2020), nor has data using more specialized methods in modernized societies (Brown & Sear, 2021).

To advance our understanding of human psychological life history strategies, I propose another method: testing the acceleration hypothesis with data from *past* societies that offer a view of the ancestral conditions that gave rise to modern adaptations. To explore human responses to harsh and unpredictable past environments, I will examine four aspects of life for large historical societies and hunter-gatherer populations representative of the past: what harshness and unpredictability looked like, whether and how calories constrained reproduction, whether there were competitive constraints on psychosocial acceleration, and how people actually responded to harshness and unpredictability in the past. Unless otherwise noted, I use the demographic transition as a boundary for modern versus historical samples (Lee, 2003).

2. What Did Harshness and Unpredictability Look Like in Past Environments?

Ellis et al. (2009, pp. 206–7) define harshness as “the rates at which external factors cause disability and death at each age in a population” and unpredictability as “the rates at which environmental harshness varies over time and space”. These are the theoretical definitions under which most of the evidence for psychosocial acceleration has been collected (Chang et al., 2019; Maranges, Hasty, Martinez, & Maner, 2022; Xu et al., 2018). Some also use paternal absence as a signal of men's willingness to invest in their children (Belsky et al., 1991) and others suggest a difference between social threat (e.g., physical abuse) and social deprivation (e.g., neglect, Ellis, Sheridan, Belsky, & McLaughlin, 2022). However, given the general absence of past levels of mortality in modernized environments, most psychosocial acceleration studies rely on indirect cues of mortality. Ellis et al. (2022) offer the following list of indirect cues of harshness and unpredictability: parental transitions, frequent residential changes, fluctuating family economic conditions, and erratic neighborhood conditions, while Maranges et al. (2022) offer cues such as neighbors arguing, an inability to buy the latest jeans or sneakers, or not going out for “nice” dinners, and Chang et al. (2019) add items such as living in a nice neighborhood or one's home being loud/“a real zoo”. But do these modern cues map onto past cues of mortality? Hunter-gatherers are, almost by definition, typically nomadic so neighborhood changes would be frequent (Hewlett & Lamb, 2005). Serial monogamy is a common pattern among several hunter-gatherer groups (e.g., Howell, 2000; Marlowe, 2010) and thus would not be a signal of impoverished environments. Seasonal changes in resources would result in regular fluctuations in family economic conditions in both hunter-gatherer and historical environments (Briggs, 1970; Hanawalt, 1986; Howell, 2000) and the common pattern of between-group migrations among hunter-gatherers would lead to benign cues of erratic neighborhood conditions (Marlowe, 2010). Going out for nice dinners and owning the best clothing were not even options for hunter-gatherer individuals while noisy, rambunctious play was common in the past. Thus, there is reason to believe that modern cues of harshness and unpredictability may not ideally overlap with past cues that were more direct and valid cues of mortality.

2.1. Past harshness and unpredictability

Infants and children faced staggeringly greater (~4600%!) chances of dying in the past (Volk & Atkinson, 2013). Over a quarter of historical infants died while just over half of children survived to puberty (rates that are slightly *less* than hunter-gatherers’; Volk & Atkinson, 2013). Thus, *actual* death, not just cues related to it, surrounded past children (Volk & Atkinson, 2013), as did severe stress that left reliable indicators on an enormous range of skeletal remains (Steckel, Rose, Spencer Larsen, & Walker, 2002). Past children did not become inured to death, as interviews of Aka hunter-gatherer adolescents showed that the deaths of loved ones were extremely emotionally upsetting and could lead to a problematic loss of appetite and/or getting sick oneself (Hewlett, 2017).

Furthermore, the greatest lifespan mortality risks in the past occurred during the first 15 years of life as almost half of historic or hunter-gatherer children died before puberty (Volk & Atkinson, 2013). In marked contrast, annual adult mortality in most hunter gatherer groups was less than 1% (Hill, Hurtado, & Walker, 2007). Thus, most salient mortality cues would be actual infant and child mortality, not adult and/or indirect cues of mortality. The majority of past infant and child deaths were due to gastro-intestinal and respiratory diseases (Volk & Atkinson, 2013). In *all* past environments serious diseases in general were orders of magnitude (10-1000×) more common than in modernized environments and included rare but devastating plagues (e.g., bubonic, small pox), seasonal scourges (e.g., malaria), and omnipresent health dangers (e.g., pneumonia; Pinker, 2018; Scheidel, 2009a). Accompanying these were various kinds of serious macroparasitic infections (e.g., Stephenson, 1994) that were also orders of magnitude more common than in modernized environments (Ryan et al., 2022). These micro- and macroparasitic infections negatively impacted growth, appetite, cognitive functioning, and the absorption of nutrients, creating a close link between infection and famine (Stephenson, 1994). Indeed, historical health often influenced, and was often influenced by, two related factors: war and famine.

While the absolute levels of war and conflict in the past remain contentious, many estimates suggest that lethal homicide was significantly higher in the past (Pinker, 2018). Past war and conflict were capable of inflicting dramatic levels of mortality, with historical Mongol invasions alone resulting in the death of millions of individuals (Behnke, 2008). In the Americas, pre-Columbian massacres often totaled hundreds of victims (Willey & Emerson, 1993). There is ample evidence for the widespread practice of torture, rape, kidnapping, slavery, and genocide across recorded human history, in archaeological sites, and in pre- and post-contact hunter-gatherer groups (Behnke, 2008; Keeley, 1996; Wilson & Bird, 2022). Among hunter-gatherer children, an estimated 2.4–7.8% died at the hands of other humans (Volk & Atkinson, 2013), which is once again orders of magnitude greater than the 0.002–0.004% of children aged 0–14 years killed today in modernized countries (Global Burden of Disease Collaborative Network, 2021.). In historic populations around the world, war frequently induced stress, mass migrations, spread diseases, reduced manpower available for growing food, destroyed crops, used up food for armies, and reduced trade leading to a scarcity of resources that would exacerbate disease risks (Behnke, 2008; Garnsey, 1988; Pearson, 1997). The same was true for hunter-gather and hunter-agriculturalist groups, for whom war and conflict often served as a loss of manpower, and/or the loss of territory or crops required, for harvesting, hunting and gathering (Chagnon, 2013; Heider, 1991; Keeley, 1996). Indeed, conflict over food/land resources was a common motive among both past hunter-gatherers (Keeley, 1996) and civilizations (Behnke, 2008; Farris, 2009).

These conflicts over food or territory existed because famines occurred with some degree of regularity, although the exact frequencies are hard to calculate (Arnold, 1988), particularly for hunter-gatherers who typically have a fear of famine but few detailed records of it (e.g., Briggs, 1970). Estimates suggest that hunter-gatherers may have experienced less famine than agriculturalists (Berbesque, Marlowe, Shaw, & Thompson, 2014), but virtually all past populations experienced occasional periods of severe nutritional deprivation (Pearson, 1997). Historically, estimates suggest that in settled areas, single-year famines occurred every 7–10 years, while 2+ year famines occurred once a generation (or about every 25 years; Garnsey, 1988; Ó Ó Gráda, 2009). The former would be enough to interfere with child growth, while the latter could cause mortality rates in excess of 10% of a local population (Farris, 2009; Ó Ó Gráda, 2009; Watkins & Menken, 1985). These generational famines were so severe that many are accompanied by credible reports of cannibalism (Garnsey, 1988; Ó Ó Gráda, 2009; Pearson, 1997). The poor, elderly, and young children (excluding breastfed infants) were particularly susceptible to famine mortality

(Alfani & Ó Gráda, 2017). At both the population (Garnsey, 1988; Ó Gráda, 2009) and individual level (Gowland, 2015), hunger and malnutrition exacerbate susceptibility to disease and vice versa. In addition to these harvest-based famines, war-based famines commonly occurred in areas with high levels of conflict (Pearson, 1997). Violence and corruption frequently accompanied the early stages of a famine before extreme levels of hunger led to widespread lethargy (Garnsey, 1988; Ó Ó Gráda, 2009). In Australia, devasting droughts were common (every 2–3 years) in the Western Desert, leading to significant mortality among the Aborigines (10–25% of the total population), especially among children (who experienced up to 50% mortality; Parsons, 2000). In temperate pre-contact North America, periods of relative abundance were interspersed with droughts and famines (e.g., Emerson, Hedman, Fort, & Emerson, 2022). In stark contrast, in modernized populations famine starvation is *virtually zero* (e.g., annually, malnutrition kills 0.005% of Canadians; Statistics Canada, 2009). War and disease negatively impacted the ability of individuals to feed themselves and famine served as a cause for both war and disease (e.g., Ancient Greece; Garnsey, 1988; Ancient Rome, Scheidel, 2009a; Medieval Near East, Ashtor, 1970; Medieval Europe; Aberth, 2013; Renaissance Europe; Cunningham, 2020; Medieval Japan; Drixler, 2013; general history, Ó Gráda, 2009; Pre-Columbian Mississippi; Emerson et al., 2022; Yanomamo; Chagnon, 2013; Grand Valley Dani; Heider, 1991; general pre-history, Keeley, 1996). Thus, past incidences of disease, war, and famine were often intimately linked with each other and were orders of magnitude more common than in modernized environments.

What's more, these highly salient causes of mortality were highly unpredictable. Famines are notoriously difficult to predict when they are caused by weather or crop failures (Garnsey, 1988). Wars and violence were often unpredictable in both their origins and eventual resolution, and a lack of medical knowledge meant that both individual and community instances of disease were difficult to predict, control, or understand. Thus, humans living in past periods were inundated with highly valid and direct cues of harshness and unpredictability. But there were within-population variations in mortality rates. Perhaps the most important of the these were the differences between past wealthy/high status individuals and past poor/low status individuals.

2.2. Past within-population differences: The roles of wealth and status

Historically, wealth and status offered protection against famine, disease, and war (Clouston, Rubin, Phelan, & Link, 2016; Farris, 2009). History shows a very strong negative link between wealth and famine mortality (Drixler, 2013; Ó Ó Gráda, 2009). Wealthy individuals' access to land, money, and food stores meant that they were much more likely to survive famine (Atkins & Osborne, 2006). Skeletal evidence shows that wealthier individuals were typically able to obtain more calorically-dense (e.g., sugars) and digestible (e.g., meat) food sources (Reitsema & Vercellotti, 2012) and they showed fewer instances of long-term malnutrition (Rohnbogner & Lewis, 2017). Skeletal data from 1000 CE Pueblo natives show that high status and wealth could buffer individuals from early stress-related mortality (Ham, Temple, Klaus, & Hunt, 2021).

With respect to various types of disease, while a few affected individuals across social classes (e.g., some forms of bubonic plague; Alfani & Murphy, 2017), many diseases were less common among the wealthy who lived in more hospitable environments (e.g., away from swampy, malaria-ridden grounds; Sallares, 2002; or in less cramped quarters; Alfani & Murphy, 2017), were less exposed to food- and water-born pathogens (e.g., had access to fresher meat and water; Anderson, 1988), had access to food and medical treatment (Clouston et al., 2016), and who had the capacity to retreat to country homes in the face of pandemics (Kelly, 2006). Thus, the majority of diseases faced by historical humans would have been partially offset by resources only available to the wealthy (Clouston et al., 2016). For example, in 16th Century England, infant mortality was twice as high among the poor as among the wealthy (Finlay, 1979). With regards to war or violence, wealthier individuals could better afford the costs of initiating aggression (Turnbull, 2012) and their wealth could make them targets of aggression (Asbridge, 2015). On the other hand, wealthier individuals were able to afford better legal protections (Blanshei, 1982; Kaeuper, 2001; Nelson, 2008), military protection (Imber, 2019; Turnbull, 2012), and individual protection in combat (Asbridge, 2015; Imber, 2019; Turnbull, 2012), and were also more likely to be ransomed in war (Asbridge, 2015). Thus, wealthy individuals were historically better equipped to start, stop, avoid, succeed at, and survive violence and war. The poor also had fewer means to seek justice (Imber, 2019), particularly for violence initiated by wealthier, more powerful individuals (Blanshei, 1982; Hanawalt, 1995).

With regards to unpredictability, historical wealth and status afforded greater access to legal, political, social, economic, and military power to gain a greater awareness of, and control over, factors that could both offer advance warning of trouble (e.g., peace treaties, tax increases) as well as the capacity to buffer the effects of harshness, thereby offering the historically wealthy a relatively more stable, predictable environment. These differences could result in profound within-population differences. The close relationships between caloric stress (famine) and other sources of past harshness and unpredictability raise the question of whether it was realistic for people in past harsh and unpredictable environments to even access the energetics required to engage in psychosocial acceleration's "fast" strategy?

3. Caloric constraints in past environments

In order to achieve a psychosocial acceleration's "fast" strategy, individuals require energy for five separate expenses: accelerating adolescent growth, progressing through puberty, growing a baby, nursing that baby, and then raising that baby into an independent adolescent. It is worth nothing that these processes not only require extra energetic, but also significant emotional, social, and cognitive costs that are beyond the scope of this paper.

3.1. Caloric estimates associated with "Fast" adaptations

Biological theories of life history are supported by evidence that organisms do indeed face energetic trade-offs (Stearns & Rodrigues, 2020). There is some evidence that humans are able to accelerate growth at the expense of height and weight (Sear, 2020), with a lack of calories at any stage resulting in stunted or diminished growth (Dewey, 2016). According to modern medical estimates, (American Heart Association et al., 2006), newborns require 900 kcal/day, 2–3 year-olds require 1000 kcal/day, 4–8 year-olds require 1200/1400 kcal day (girls/boys), 9–13 year-olds require 1600/1800 kcal/day, and 14–18 year-olds require 1800/2200 kcal/day. This results in a difference of approximately 400 cal a day to shift from childhood to early pubertal growth (a ~ 30% increase). In total, to raise a child to age 16 would ideally require 8.5 million kcal for a girl (10 million to age 18) and 9.5 million kcal for a boy (11 million to age 18). Once an individual is fertile, they must have sufficient calories for fertilization and pregnancy. For boys, male gamete production is highly insensitive to nutritional status, so it is unlikely to be affected by any but famine-levels of nutrition (Ellison, 2003). In contrast, girls' fertility is closely linked to their nutritional status, with weight losses of 10–15% triggering amenorrhea (Frisch, 1994). For an average-weight women in modernized populations, caloric metabolic expenditures increase to ~390 kcal/day in the second and third trimesters while an additional 240 kcal/day throughout the pregnancy is needed for normal weight-women to reach medically recommended weight gains (for a total of ~137,400 kcal; Most, Dervis, Haman, Adamo, & Redman, 2019). For underweight women, this total increases to 171,000 kcal and conversely, the total is smaller for overweight or obese women (Butte & King, 2007; Most et al., 2019). The total amount may be lower for women who are undernourished and thus exhibit lower metabolic expenditures (Butte & King, 2007), but this lower weight increases health risks to both the mother and the fetus (see Section 4.3). On top of these increased caloric costs, pregnancy increases the required uptake of numerous vitamins and minerals to support both the mother and the fetus (Dewey, 2016; Kominiarek & Rajan, 2016). Finally, while not a caloric cost, each childbirth posed a severe mortality risk to mothers, with 1–2% of historic and hunter-gatherer mothers dying per pregnancy (Lassek & Gaulin, 2021; Podd, 2020). Following a costly and risky pregnancy, women in the past typically had to breastfeed their infants at the cost of up ~700 kcal/day (Ellison, 2003). Compared to other mammals, humans have a relatively low cost of lactation (Prentice & Prentice, 1988). These low costs, in combination with the ability to transfer calories from fat reserves built up during adolescence and pregnancy, help to explain why infants have lower mortality rates in famine than older, weaned children (Ó Ó Gráda, 2009) as breastfeeding and maternal weight gain appear to adaptively buffer against fluctuations in caloric availability. However, restrictions to maternal nutrition during breastfeeding prolong lactational amenorrhea and result in poorer-quality milk (Bourbou, 2018; Tracer, 1996). To summarize, a “fast” strategy requires an expenditure of 400 kcal/day for several years to achieve pubertal fertility (typically 1–3 years following menarche/spermarche), followed by (in girls) 9 months of pregnant energy expenditure of the same level, followed by ~3 years of lactation (at 700 kcal/day), and then the millions of calories required to feed the child as it grows for the remainder of its life. Furthermore, infants (and children) require greater caloric intake when they are sick or parasite-ridden, so these optimal estimates may have been even higher in the past (Dewey & Mayers, 2011; Ashtor, 1970). Were these calories available?

3.2. *Estimates of caloric availability in the past*

In both historical and hunter-gatherer samples, there are wide ranges of daily caloric intakes. In numerous hunter-gatherer cultures, the average number of daily calories was relatively modest (Hill, Hawkes, Hurtado, & Kaplan, 1984). Among the!Kung, daily caloric intake fluctuated seasonally, from a high of 2400 kcal/day to a low of 1200 kcal/day (Wilmsen, 1982). In contrast, Ache (who were ~ 10 kg heavier) seasonal intakes ranged from an average high of almost 5500 kcal/day to a low of 3000 kcal/day (Hill et al., 1984). Among the Hadza, mature adult women are able to gather 3000 kcal/day while men provide 2500 kcal/day, but these were shared with offspring and dependent kin with adults' total energy expenditure average ~ 2500 kcal/day (Pontzer, Wood, & Raichlen, 2018). Overall, while caloric intakes appear to fluctuate between different societies, all of the societies appear to operate on a relatively neutral, or slightly negative, intake-expenditure balance. Both the!Kung and the Ache gained weight when they moved from traditional hunting to visiting modernized shelters/missions (Hill et al., 1984; Wilmsen, 1982), suggesting that their nutritional intakes were slightly less than their energetic outputs (that are ~2500 kcal in the!Kung and 4000 or higher in male Ache). Most importantly, overweight individuals were entirely absent in all of these hunter-gatherer populations, demonstrating that they did not regularly have caloric surpluses (e.g., Krech-III, 1978). Thus, in the vast majority of hunter-gatherer cultures (including those in temperate climates), the feasibility of obtaining hundreds of extra kilocalories per day was highly questionable (Pontzer et al., 2018). Among historical cultures, famine or drought could lead to widespread mortality and even the collapse of a civilization (e.g., the Mayans; Oglesby, Sever, Saturno, Erickson III, & Srikishen, 2010). As with hunter-gatherers, there was a wide range of estimated daily caloric intakes. While the most notable difference was between the historically wealthy and the poor (Anderson, 1988; Forgeng, 2010; Marzano, 2018), there were also differences based on location or lifestyle. For example, medieval sailors on a warship, or knights on a crusade, could receive up to 4000 kcals/day to match their intense energetic expenditures (Ashtor, 1970; Mott, 2018). In contrast, medieval day laborers could receive as few as 1200 to 2000 kcal/day, with inland protein sources commonly coming from such undesirable foods as field mice, snakes, and dead pack animals (Ashtor, 1970). For much of history, and particularly in settled areas with modest to high population densities, the historically poor had few, in any, reserves to draw upon and thus lived on the edges of subsistence (Farris, 2009; Forgeng, 2010; Hanawalt, 1986, 1995; Rohnbogner & Lewis, 2017). An estimated half of the population of Rome lived at or below this subsistence level (Atkins & Osborne, 2006) while virtually all past skeletal remains are associated with nutritional stress, particularly among the poor (Steckel et al., 2002). Written and skeletal data clearly show that the poor were also subject to greater levels of caloric deficits and malnutrition that bidirectionally increased their vulnerability to disease (Bourbou, 2018; Gowland, 2015; Yaussy & DeWitte, 2018). Thus, the reality is that for the majority of historical and hunter-gatherer individuals, calories were scarce, particularly for those who lived in harsher and less unpredictable environments. But would psychosocial acceleration have been competitively adaptive even if past individuals could engage in it?

4. Competitive constraints on pubertal acceleration in the past

Psychosocial acceleration argues that early maturation and reproduction is exchanged for long-term growth and parental investment (Ellis, 2004; Hochberg & Belsky, 2013). In theory, such trade-offs are energetically plausible (Pontzer & McGrosky, 2022). What would have been the competitive consequences of psychosocially accelerating puberty in past environments?

4.1. *Past competition for boys/men*

For men, past reproductive success was most influenced by the ability to attract a stable mate(s) and provide for one's offspring (Geary, 2021). Beginning with the former, women tend to be attracted to physically taller and stronger men (Apicella, 2014; Pawlowski, Dunbar, & Lipowicz, 2000; Sell, Lukazsweski, & Townsley, 2017), both outcomes that would be impeded by trading growth calories for early maturation. This might make a 14 year-old accelerated “fast” adolescent boy more attractive than a 14 year- “slow” peer, but the average age of (functional) marriage for men in both past historical and hunter-gatherer societies almost universally occurred towards or after the end of puberty, not its beginning (e.g., Chagnon, 2013; Cunningham, 2020; Farris, 2009; Golden, 1990; Hanawalt, 1995; Marlowe, 2010; Rawson, 2003). Thus, by the time adolescent boys were regarded as reproductive men, any initial height or strength gains would be exceeded by an individual who delayed maturational onset for greater growth. This would be further exacerbated by the demands that hunting and farming place on male strength (Apicella, 2014; Hanawalt, 1986; Havelková, Villotte, Velemínský, Poláček, & Dobisíková, 2011; Hewlett & Lamb, 2005), as provisioning capacity was another attractive intersexual trait in the past (Apicella, 2014; Howell, 2000; Trigger, 1969). This reduced intersexual attractiveness would be further compounded by intrasexual disadvantages. By sacrificing height and strength for early growth, psychosocially accelerated boys would gain an initial advantage that would quickly be lost against eventually stronger and taller competitors (Petersen, Sznycer, Sell, Cosmides, & Tooby, 2013; Sell, Eisner, & Ribeaud, 2016). Critically, the polygynous and competitive nature of most human societies meant that early maturation would have led to competing not just against peers, but also mature men who had not sacrificed growth for early maturation (Geary, 2021). Leaving aside their smaller stature and strength, early-maturing individuals' lack of experience would be a critical disadvantage in winning conflicts against older men (Asbridge, 2015; Chagnon, 2013). Similarly, while these younger men might possess basic survival skills, they would lack the years of experience needed for successful big game hunting (Lew-Levy, Reckin, Lavi, Cristóbal-Azkarate, & Ellis-Davies, 2017). Evidence from multiple hunter-gatherer cultures show that better hunters have higher reproductive success (Apicella, 2014; Smith, 2004). Among historic populations, non-wealthy men needed additional time beyond puberty to acquire the land, job skills, social connections, and/or resources required to support a family (Cunningham, 2020; Farris, 2009; Golden, 1990; Hanawalt, 1995; Hsiung, 2005; Rawson, 2003). The same was true for pastoralists who needed time to build a suitable herd of animals (Geary, 2021). While a wealthy boy might be able to accelerate puberty without incurring trade-off penalties to adult size (and wealth), that was not an option for non-wealthy boys in harsher and more unpredictable environments, making their acceleration less adaptively competitive.

4.2. Past competitive for girls/women

For girls/women, much of the same adaptive logic applies. With regards to intersexual attractiveness, men value signals of good health (Geary, 2021) as well as the calorically expensive deposits of fat that underly fuller breasts and wider hips (Havlíček et al., 2017; Pazhoohi, Arantes, Kingstone, & Pinal, 2020) that in turn correlate with fertility (Jasieńska, Ziomkiewicz, Ellison, Lipson, & Thune, 2004). Caloric trade-offs would compromise the expression of these female traits. As with men, size and experience are both related to women's increased capacity to provide (i.e., forage for) food (Hewlett & Lamb, 2005), a trait that was generally attractive to hunter-gatherer men (Howell, 2000). One might argue that smaller women could simply work harder, but even if one ignores the extra calories that would require, excessive physical work can supress ovarian functioning in energetically neutral women, resulting in temporary infertility (Jasieńska & Ellison, 1998). With regards to intrasexual aggression, while less common and severe in women, it did occur and could be critical to reproductive success (Geary, 2021; Hrdy, 1999; Hsiung, 2005). Girls who sacrificed growth, experience and strength for early maturation and reproduction would, like psychosocially accelerated boys, thus face competitive intra- and intersexual disadvantages.

4.3. Past Offspring survival and competitiveness

Women also faced reproductive challenges related to maturation-weight trade-offs. Women who sacrifice fat reserves for early maturation may lack the ability to even be fertile (Frisch, 1994). Assuming a more modest trade of height and weight for early maturation, there were still risks to past mothers and their fetuses. Modernized data show that significantly shorter women face 5× the likelihood of needing a cesarian birth (Marbaniang, Lhungdim, & Chaurasia, 2022). In modern low- to middle-income populations, taller mothers have a lower risk of offspring: mortality, low birth weight (LBW), or stunting (Özaltin, Hill, & Subramanian, 2010). Teenage mothers have 2.5× the risk of anemia, 3× the risk of pre-term births, 2× the risk of hypertension, and are 2× more likely to have LBW infants (Mahavarkar, Madhu, & Mule, 2008). These patterns also hold in small-scale modern populations (Pollet & Nettle, 2008). Gambian girls who experienced earlier puberty had shorter adult heights and reduced adult fertility (Sear, Allal, & Mace, 2004). Pleistocene hunter-gatherer skeletal remains show a spike in adolescent girls' mortality around the age of first childbirth that are suggestive of heightened early-pregnancy mortality (French & Nowell, 2022). These maternal risks are compounded with offspring health risks. In developing countries in Africa, Asia, and Central America during the mid-20th Century, smaller and younger mothers had a significantly greater risk of having LBW infant (Spielmann, 1989). Shorter mothers in developing countries were also more likely to have LBW infants in response to food scarcity (Lechtig et al., 1975; Spielmann, 1989). Finally, stress and malnutrition are significant risks for premature/LBW births (Desta, 2019). In modern times, low birth weight remains the single biggest predictor of infant mortality (WHO, 2014). In famine-prone parts of India (1968–1973), on average, child mortality doubled with each 10% decline below 80% of the Harvard weight median (Kielmann & McCord, 1978). Mortality-rates were highest just before and during the main (wheat) harvest when calories were scarce, but only for children who were in poor nutritional health (Kielmann & McCord, 1978). LBW babies in impoverished, 1969 Guatemalan villages were 4× more likely to die (Habicht, Yarbrough, Lechtig, & Klein, 1973) while LBW babies in impoverished, 1970s Bangladesh were 3× more likely to die (Spielmann, 1989). Premature/LBW infants who survived faced greatly increased chances of: stunted growth, high blood pressure, non-insulin dependent diabetes mellitus, coronary heart disease, and stroke in adulthood (Qadir & Bhutta, 2009). Thus, beyond individual competitive capacity, there are substantial risks to the competitiveness and survival of offspring from younger, smaller, weaker, inexperienced, and/or poorly-provisioning mothers and fathers.

5. Historic and hunter-gatherer life history strategies

I now turn to the question of what life history strategies did past historic and hunter-gatherer individuals actually engage in when faced with harsh and unpredictable environments? In particular, did they adopt a “fast” response to harsher and more unpredictable environments? To answer this question, I examine both longitudinal evidence and within-population evidence.

5.1. Past longitudinal evidence for life history strategies

Secular evidence over the last two hundred years clearly shows a dramatic decline in mortality causes, cues, and rates (Gluckman & Hanson, 2006; Lee, 2003). Modernized children no longer have reliable, persistent, and valid cues that they will die before reproducing, so according to psychosocial acceleration theory they should have slower life history strategies (Ellis et al., 2022). Yet, pubertal ages have consistently dropped across all modernized societies (Lee, 2003; Pinker, 2018; Volk & Atkinson, 2013). Clearly, at the broadest level, humans have accelerated puberty in response to more benign and predictable environments. Beyond this global longitudinal trend, we can also gain longitudinal insights into past populations' reactions to more benign versus harsher environments. Once such example comes from the remarkably complete bio-archaeological data from the Upper Mississippi valley (USA) around 1100 CE, when a global climactic shift produced warmer weather and more benign agricultural conditions (Wilson & Bird, 2022). This led to a growing hunting, gathering, and farming settlement in the Upper Mississippi valley (Wilson & Bird, 2022). In the 12th Century, relative to earlier periods, there was ample skeletal evidence of low levels of disease, low levels of adolescent/young adult female mortality, and virtually no evidence of violent deaths (Wilson & Bird, 2022). These positive outcomes are believed to be due to an abundance of resources and are associated with a period of accelerated individual and population growth rates. At the start of the 13th Century, large, fortified walls were erected around the settlements at the same time as nearby lake sediments showed evidence of severe drought. These walls were accompanied by increased evidence over time for: a less varied diet (due to poorer harvests and increased foraging risks), nutritional stress, disease, violent deaths (found in 4.5–9% of skeletal remains), a reduction in growth rates, and increased disease and mortality, particularly among older adolescent girls/young women (Wilson & Bird, 2022). The latter were believed to reflect the heightened burden these harsh conditions imposed upon young pregnant women (Wilson, 2014). As the environmental conditions continued to deteriorate the population and fertility levels declined, villages were violently razed to ground, and the settlements ceased to exist as members abandoned agriculture and resumed a more dispersed hunter-gatherer lifestyle (Wilson & Bird, 2022). Thus, members of this population responded to benign environments by growing faster, being healthier, having fewer reproductive problems, having more offspring, and living more peacefully. When conditions became harsher and more unpredictable through food scarcity, war, and disease, the opposite pattern occurred.

From a biological perspective, fast life history strategies (i.e., “r”) can be expected when a population has abundant resources and is well below carrying capacity (Pianka, 1970). These kinds of strategies were observed in population booms that followed a devastating smallpox pandemic in Ancient Japan (Farris, 2009) and by the population expansion of early colonial North America where despite many cues of harshness, fecundity exceeded European levels (Nault, Desjardins, & Légaré, 1990). Indeed, the original inhabitation of the Americas is believed to have triggered a population boom due to abundant resources (Surovell, 2000). A similar population boom occurred following the Black Plague in Europe where skeletal pubertal data demonstrate a decreased age of puberty for decades after the Black Plague (DeWitte & Lewis, 2021). In all of these historical natural experiments, the menarche decrease and/or fecundity increase lasted for *decades*, thus countering theories of acute psychosocial acceleration. Contemporary and modern historians attributed these changes to an increase in caloric resources (abundant game, farming land, and/or wages) that were made available by lower population densities that in turn encouraged greater growth and fecundity (DeWitte & Lewis, 2021; Farris, 2009).

5.2. Past Within-population evidence for life history strategies

I now turn to within-population comparisons of historically wealthy versus poor individuals. As already noted in Section 2, when compared to wealthy individuals, poorer individuals experienced harsher and less predictable past environments. I begin the comparison by focusing on menarche as it is more reliably detectable than spermarche.

5.2.1. Past differences in menarchal timing

An examination of past skeletal data reveals several important aspects of historical pubertal development: it started at similar ages to modern children (10—12), proceeded much more slowly (menarche at ages 15–17), ended later, and there was a degree of individual variation (Arthur, Gowland, & Redfern, 2016; Doe et al., 2019; Doe, Pérez, Cambra-Moo, Martín, & Martín, 2019; Lewis, Shapland, & Watts, 2016a). In both modern and historical samples pre-puberty begins at around age 8, but in comparison to the modern age of menarche of 12, skeletal data reveal that the average age of menarche was indeed later in Etruscan (14; Bareggi, Pellegrino, Giuffra, & Riccomi, 2022), Roman Britain (15; Arthur et al. 2016), Medieval England (15–17; Lewis et al., 2016a), and Medieval Islamic Spain (16–17; Doe, Pérez, et al., 2019). Therefore, historical samples have a broader intraindividual range of pubertal stage timing (up to 8 years) as compared to modern data (4–5 years; Bareggi et al., 2022). The most likely explanation for this broader range of menarche ages is that there was a broader range of energetics available to adolescents in the past. Historical medical texts corroborate skeletal data as they state that menarche typically occurred after 14 years had been completed (with a few after the 12–13 range, and many after 15 years; Amundsen & Diers, 1969, 1973; Medvei, 1982; Pilkington, 2013). Intriguingly, historical reports focusing on upper-caste Indian adolescents suggest that menarche started around age 12, signifying that perhaps this wealthy group's increased resources did lead to earlier menarche (Datta & Gupta, 1981). Pilkington (2013) used demographic modelling to estimate an average age of 14 years for menarche in Ancient Rome, with taller/wealthier girls experiencing earlier pubertal development. In contrast, using skeletal evidence from 62 Gaulic and 52 Roman female skeletal samples, Avery, Prowse, Findlay, Chapelain de Seréville-Niel, and Brickley (n.d.) found that among middle class Roman citizens, the age of menarche was 15.4 years. Lewis, Shapland, and Watts' (2016b) found that chronically poor health and nutrition were associated with delayed skeletal pubertal maturation in medieval England. Similar morphologies were revealed in an analysis of skeletal slave remains that also showed delayed pubertal maturation (Fricke, Laffoon, Victorina, & Haviser, 2020). A pregnant adolescent from Medieval Spain was found to be in the later phases of adolescence at ages 20–21 and was 12 cm shorter than average for her population, likely due to energetic trade-offs associated with her pregnancy (Doe et al., 2022). Gluckman and Hanson (2006) have proposed that these historic ages of menarche are in fact aberrations from hunter-gatherer patterns, a view that has been cited by some theorists (e.g., Hochberg & Belsky, 2013). Specifically, their hypothetical calculations claiming that hunter-gatherer menarche occurred at ages 7–13 (and thus coincided with or even preceded modern menarche ages) are not supported by actual data from hunter-gatherers, whose historical age of menarche was around 15 years before longitudinally declining in modernity after harshness and unpredictability were reduced (Bojlen & Bentzon, 1968; Howell, 2000; Marlowe, 2010; Sillitoe, 2006). Even when these hunter-gatherer data are supplemented by data from other small-scale societies (e.g., hunter-agriculturalists and pastoralists), a sample of 23 hunter-gatherer/small-scale societies[1] yielded an average age of menarche of 15.0 years (SD = 1.6; Walker, 2022; Bojlen & Bentzon, 1968).

5.2.2. Past differences in pregnancy and first births

While height and age of menarche are positively linked in modernized populations, modern small-scale populations show the opposite pattern whereby poor nutrition, stress, and/or disease inhibited both growth and pubertal maturation (McIntyre & Kacerosky, 2011; Sohn, 2014). Older San žu/ŏasi hunter-gatherer women say that pregnancies happen when food is plentiful and weights are higher, not when “thinness has taken us”. Conception among San women clustered around the months of greatest food availability, but only for foraging (versus government-supplemented) women (Wilmsen, 1982). These žu/ŏasi women were consciously aware of the caloric life history trade-offs as they stated that it “would be crazy to catch a child when they are thin because god would only take it back again” (Wilmsen, 1982, pg. 115).

Beyond waiting longer for physical maturation, the historically poor were burdened by economic considerations (the costs of marriage and starting one's household; Hanawalt, 1986; Hsiung, 2005) and employment constraints (employers/masters did not want their charges to be pregnant or parenting rather than working; Hanawalt, 1995; Parkin, 2019) that often limited their ability to engage in legally sanctioned marriage until their mid- to late-twenties. In 16th Century London wealthier women married an average of 2 years earlier than poorer women (Finlay, 1979), resulting in up to 66% greater fertility (Boberg-Fazlic, Sharp, & Weisdorf, 2011). Illegitimate marriage was a potential alternative, albeit a rather poor one that led to serious social, religious, and potentially legal sanctions that would also seriously affect the future social acceptance and economic trajectory of poor children born outside of wedlock (Hanawalt, 1995;Hsiung, 2005; Rawson, 2003). While similar factors would have impacted illegitimate children of the wealthy, their wealthy parents could offset these costs in ways that were impossible for poor parents (Hanawalt, 1995; Rawson, 2003). This can be witnessed in baptismal rates being 4× higher for illegitimate children of wealthy versus poor parents (Finlay, 1979). Given that a critical feature of life history strategies is greater fertility, it is worth noting that being married was perhaps the best signal of being willing and able to have children as historically marriage was very strongly legally and culturally linked to starting a family and to overall historical fertility (Shaw, 1987).

Across global history, wealthier women tended to marry at younger ages than their peers (Hsiung, 2005; Rawson, 2003). Throughout European history, historically wealth women tended to marry in their early teens as compared to late teens or early twenties (Cunningham, 2020; Golden, 1990; Hanawalt, 1986, 1995; Podd, 2020; Scheidel, 2009b). In Ancient Rome, the legal limits for marriage were 12 for girls and 14 for boys (Rawson, 2003). Those legal limits only applied to wealthy girls as

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[1] Ache forest dwellers, Aeta, Agta (Cagayan/forager), Baka, Batak, Efe, Gainj&Asai, Hadza, Hiwi, Inuit, Ju/hoansi, Maya, Pygmy (East & West Africa), Toba, Tsimane, Turkana, Tutsi, Walbiri, Wichi, Yupik

poor girls married later while boys of all classes tended to be a decade or more older due to the greater time it took for a boy/man to afford his own household (Golden, 2009; Shaw, 1987). These early adolescence marriages of wealthy historical girls ran counter to contemporary legal, medical, and practical advice for age of first childbirth (as well as modal ages of actual childbirth) that clustered around late teens or early twenties (Parkin, 2019; Podd, 2020). Thus, wealthy women in historical populations typically reached menarche, marriage, and age of first childbirth at an earlier age. While cultural factors undoubtedly played a role, the physical reality is that wealthier adolescents had greater access to the resources that were needed to promote earlier menarche and buffer against disease, famine, and violence. Critically, they also had the economic means to pay for an early marriage, start a household, and raise children independently of their parents (Rawson, 2003; Hanawalt, 1995; Hsiung, 2005). Evidence from pre-industrial Finland (largely prior to the demographic transition) show that women from wealthier homes had greater overall fecundity and that their offspring did not suffer from a quantity vs. quality trade-off as did landless women's (Gillespie, 2008). This lack of a trade-off may be due, in part, to wealthy women supplementing their own maternal investment with the paid or enslaved help of other women.

5.2.3. Past differences in lactation habits and Interbirth intervals

Perhaps the most visible example of this help was how wealthy women across a vast array of cultures used wet nurses to reduce the caloric demands of nursing, increase their fertility, and/or maintain societal expectations (Cunningham, 2020; Golden, 1990; Hanawalt, 1986; Hsiung, 2005; McLaren, 2005; Rawson, 2003; Shivram, 2008). A significant amount of care went into selecting a wet nurse, ensuring that they were sufficiently healthy, not thin, and had a proper temperament for caring for an infant (Heywood, 2018; Lee, 2000). Data from the early demographic transition suggest that wealthy infants might have had slightly higher mortality from wet nursing, perhaps due to the possibility of wet nurse neglect (Davenport, 2019). Conversely, other data show an increase in survival with wet nursing (see Hrdy, 1992) and there are numerous stories and wills documenting the strong attachment bonds formed between wet nurses and their wealthy charges (Hanawalt, 1995; Lee, 2000; Shivram, 2008). Generally speaking, historical evidence supports lower infant and child mortality rates among the wealthy (Redfern & DeWitte, 2011; Ward et al., 2019). So, if historical wealthy women reduced their direct parental investment (e.g., by using a wet nursed), they compensated by provisioning indirect alloparental investment (e.g., paying for a high-quality wet nurse alongside other childcare professionals like paedagogi; Cunningham, 2020; Rawson, 2003; Hanawalt, 1995). Conversely, historical skeletal evidence reveals that poorer or more stressed mothers provided less nutritious breastmilk that reduced the growth and health of their own infants (Bourbou, 2018; Crowder, Montgomery, Gröcke, & Filipek, 2019) and led to poorer wet nurse health (Mays, 2010).

An important evolutionary consequence of wet nursing is its reduction of interbirth intervals via the elimination of lactational amenorrhea (Hrdy, 1992; Lee, 2000; Parkin, 2013). Wealthy English women in the 16th Century who sent their infants to wet-nurses had double the fertility of middle-class or poor women who fed their own infants (McLaren, 2005) while Roman elites commonly achieved large family size by using poor or enslaved wet nurses (Parkin, 2013). In contrast, poorer women who were employed as wet nurses tended to see a reduction in their own fertility due to lactational amenorrhea (Hrdy, 1992). A study of wet nurses in 16th Century England found that wet nursing another baby more than doubled birth intervals (McLaren, 2005). Among the Au forager-agriculturalists, wealthier, well-nourished mothers experienced their first post-partum menses over a year sooner (12.5 months) than their poorly nourished counterparts (26.5 months; Tracer, 1996). In 16th Century London, wealthier women had shorter interbirth intervals normally and when a baby of more than one month old was lost (due to reduced lactation costs; Finlay, 1979). When combined with an earlier start to reproduction, the ability to reproduce more frequently let wealthy mothers translate more benign environments into earlier and shorter birth intervals that then translated into greater lifelong fertility supported at the expense of poorer allomothers (Hanawalt, 1986; Hrdy, 1992; Netting, 1982).

5.2.4. Past differences in child abandonment and infanticide

When faced with a lack of resources historically poor parents faced the harsh reality of being unable to provide the basic necessities of life for a child. While infanticide was generally illegal throughout history, it was often either socially tolerated or ignored if it was practiced by poor families who could not afford to care for their children (Hanawalt, 1986). In 1791 (at the cusp of the modern demographic transition), an Eastern Japanese official interested in eliminating infanticide noted five causes: an insufficiency of milk due to close interbirth intervals; absolute destitution; "stupid women" (i.e., unmarried mothers); hindrance of the mothers' ability to work; the ability to feed the infant but inability to properly clothe and marry them later in life (Drixler, 2013). While some of these reasons applied to wealthy mothers, economic hardship was a clear factor in promoting historic infanticide in Japan and beyond (Drixler, 2013; Hrdy, 1999). It was also a common reason for infanticide among hunter-gatherers (alongside infant deformities; Howell, 2000; Hrdy, 1999). Given the widespread history of legal and governmental sanctions against infanticide, another common alternative was for historically poor parents to either sell their children or place them in the care of foundling institutions (Cunningham, 2020; Golden, 1990; Hrdy, 1992; Rawson, 2003). Tragically, these options were highly risky, with slaves living bleak lives while up to 90% of foundlings died, making parents desperate to buy back their children if their economic circumstances improved (Cunningham, 2020). Taken together, all of these factors may account for why contraceptive usage was more common among the historically poor and middle classes than among the wealthy (Heywood, 2018) as they sought to limit their caloric losses by having fewer children who might each have enough calories to live rather than trying to have many infants who could only draw away precious calories before dying.

5.2.5. Past differences in male fecundity

The fecundity disparity is even greater for historical men. For almost all historical cultures, male wealth and power was strongly correlated with increased polygyny and reproductive success (Betzig, 1986). It was the wealthy elite, the good hunters, the men who controlled access to a watering hole, or the militarily dominant, that engaged in early and frequent reproduction, not the poor, weak, displaced, or disenfranchised (Betzig, 2012). For example, in China from AD 1400-1900, wealthy Confucian scholars had triple the number of sons as compared to commoners due to multiple marriages (Hu, 2020). This trend is true even in cultures that prohibited polygyny as wealthy men in those cultures tended to father additional illegitimate children via slaves or servants (Farris, 2009; Golden, 1990; Hanawalt, 1995; Rawson, 2003). As noted above, wealthier men in Medieval London were more likely to baptize their illegitimate offspring, giving these extra offspring greater access to social and material resources (Finlay, 1979). Wealthy 17th Century Englishmen left behind twice the number of offspring as compared to the poorest men (Clark & Hamilton, 2006). Wealthier men throughout history tended to marry younger wives, presumably because they could both afford the attention of young and well-fed (i.e., fertile) brides as well as supply the resources needed for their offspring (Boberg-Fazlic et al., 2011; Golden, 1990; Rawson, 2003). While smaller societies tended towards being more egalitarian (Betzig, 2012), in hunter-gatherers/agriculturalists, more proficient hunters or leaders had greater reproductive success and/or more wives (Apicella, 2014; Betzig, 2012; Briggs, 1970; Chagnon, 2013; Heider, 1991; Kaplan & Hill, 1985; Smith, 2004; Smith, Bliege Bird, & Bird, 2003).

The extent of this reproductive leveraging by wealthy males could be staggering. For example, starting in the 17th Century, Moulay Ismael the

Bloodthirsty is reported as having sired *hundreds* of children (Oberzaucher & Grammer, 2014)! Genetic data reveal that between 5000 and 7000 BP, in Europe, Africa, and Asia there was a striking drop in the diversity of the Y chromosome without any accompanying change in mitochondrial DNA. This demonstrates a group of elite men monopolizing a large percentage of the gene pool (Zeng, Aw, & Feldman, 2018). In Ireland, descendants of Niall of the Nine represent Ireland's longest and most powerful lineage who are also the ancestors of 20% of Irish men today (Moore, McEvoy, Cape, Simms, & Bradley, 2006). In China, the family of Nurhaci (1559–1626) unified the Manchurian tribes in the north and founded the Qing dynasty, leaving behind not only a powerful political dynasty, but also ancestry over 3.3.% of all East Asian men (Xue et al., 2005). Genetic data revealed that approximately 1% of humans alive today (or about 8% of Asian men) are descended from another Asian familial dynasty- that of Genghis Khan and his sons (Zerjal et al., 2003). Finally, yet another study of Asian DNA suggests that "3 great grandfathers" were in fact the Neolithic ancestors to both the Han dynasty and 40% of Chinese men today (Yan et al., 2014). Together, these were dynasties of wealthy, privileged men whose offspring experienced less harsh and unpredictable environments than other men around them (e.g., the millions slaughtered by Genghis Khan and his sons; Behnke, 2008). Findings from almost a millennium (!) of English data show that wealthy fathers were proficient in passing on their wealth to their offspring, thereby preserving their more benign environments and associated reproductive advantages across generations (Clark & Cummins, 2014). Furthermore, evidence from the past 450 years of Swiss genealogy show that individuals who reproduced more left a larger genetic imprint on the Swiss population, with virtually no evidence of a quantity-quality trade-off (Young, Chesterton, Lummma, Postma, & Dugale, n.d.). Thus, wealthier, high-status men in the past were more successful in transmitting both wealth and genes into subsequent generations.

5.2.6. Past meanings and impacts of paternal absence

What about past children who lacked a father? According to psychosocial acceleration, father absence is a signal of untrustworthiness and selfishness in intimate relationships (Belsky et al., 1991). However, in historical times fathers weren't just absent because of divorce or illegitimacy, they were often absent because they were dead. In Ancient Rome, 28% of elites, and 37% of commoners, lost their father by age 15, while 49/61% lost their fathers by age 25 (Scheidel, 2009b). These were not valid signals of male selfishness or untrustworthiness, but rather the brutal reality of pre-modern life. For most families, and especially for poor families, the loss of a father represented a significant loss of economic and legal resources (Golden, 2009). Common responses among past widowed mothers were to abandon young infants (Scheidel, 2009b), seek support from paternal kin (Golden, 2009), and to remarry if sufficient funds remained for a dowry (Hübner & Ratzan, 2009). There is no evidence among Ancient Greek or Roman sources that father absence led to a fast life history strategy (Hübner & Ratzan, 2009). This pattern of paternal loss being due to death (versus men emphasizing mating effort) and leading to economic and social hardship was common throughout history (Hanawalt, 1995) and was met with a response that is now familiar- past individuals who faced a harsh and unpredictable future limited their energetic and reproductive output until times got better.

6. Conclusions

To summarize, in both hunter-gatherer and historic populations, harsher and more unpredictable conditions led to a "slower" life history strategy where: a) growth and menarche/spermarche were delayed, b) reproduction was delayed due to energetic constraints and behavioral choices; c) overall fertility was reduced due to energetic constraints and behavioral choices; d) direct parental invest was as high as local energetics would permit. The reverse was largely true for the wealthy/high status individuals who translated less harsh and more predictable living conditions into earlier reproductive maturity and growth, earlier reproduction, greater total reproduction, and the co-opting of paid or slave labor to provide alloparental care for their larger pool of offspring. Thus, past data support *the opposite* pattern of life history as is seen in modernized environments and suggested by psychosocial acceleration.

The historical and hunter-gatherer data I present are not without limitations. A concern in virtually all life history research is the correlational nature of the data. As with modern data, it is difficult to differentiate environmental causes from evolved responses, but alongside natural experiments (e.g., environmental changes in the Upper Mississippi), the logical primacy of mortality and energetic concerns are an important causal consideration. A second, more technical, concern is the difficulty in accurately measuring all of the different energetic aspects of life history in past populations. Fortunately, new data and techniques are offering exciting specific insights into ages of menarche (e.g., Lewis et al., 2016a), fecundity (Yan et al., 2014), and harsh experiences (Steckel et al., 2002).

The study of human life history might also benefit from greater cross-species comparisons. In many primate species, greater resources and less harsh conditions translate into earlier spermarche/menarche and greater lifetime reproductive success (Stephens & Wallen, 2013). Female chimpanzees (*Pan troglodytes*) exposed to harsh or unpredictable environments experience delayed sexual maturation by an average of 2.6 years (if orphaned before age eight) to 3.8 years (if born to low-ranking mothers; Walker, Walker, Goodall, & Pusey, 2018). Females whose mother was not high-ranking had their first birth at an average of an average of 2.2 years later, those who were orphans 3.2 years later, those whose mothers were nulliparous 3.3 years later, and those who dispersed from their group 3.75 years later (Walker et al., 2018). The main reason for these trends is that chimpanzee females use higher status to gain access to more/better food resources that are in turn translated into higher infant survival, faster maturing daughters, and more rapid production of offspring (Pusey, Williams, & Goodall, 1997). For male chimpanzees, higher social status is perhaps the most important predictor of overall reproductive success (Wroblewski et al., 2009).

Thus, the life history pattern between harshness and life history in most primates, and for chimpanzees in particular, closely resemble those of historical and hunter-gatherer humans whereby the availability of resources positively related to faster life history outcomes. Across history and cultures, energetics, rather than psychosocial cues of harshness or unpredictability, dictated the pace of life histories in past populations. History and hunter-gatherers show us that humans living in the past responded to the direct realities of caloric (in)availability, individual growth, reproduction, and mortality risks by speeding up their life history when times were benign and slowing it down when times where harsher or more unpredictable.

Declaration of competing interests

he authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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