The premise that reproduction carries costs in the form of reductions in somatic maintenance and lifespan is a fundamental principle in evolutionary theory and reproductive ecology (Williams 1957; Rose 1994; Hill and Kaplan 1999; Crews 2003). Although research in both historical and contemporary human populations supports a cost of reproduction (CoR) in women (Hurt et al. 2006; Zeng et al. 2016), there is poorer direct evidence for CoR in men. While CoR may be important to men’s health, they have not been as extensively studied as CoR in women, perhaps due to the challenges of quantifying reproductive effort – and putatively-associated costs – in men.

In females, reproductive effort is highest during pregnancy, lactation, and offspring rearing, which mostly scale with offspring number (Jasienska et al. 2017). In males, reproductive effort may be more sharply defined by mating and parenting effort, both of which vary considerably with socioecological context (Trivers 1972; Geary 2015). In men, mating and parenting effort in turn involve potentially competing somatic, physiological, and behavioral components that can be largely uncoupled from offspring number (Bribiescas 2001; but see Hill and Hurtado 1996). Quantifying reproductive effort in men thus requires comparatively detailed anthropometric, behavioral, and physiological measures (e.g. body composition, sexual behavior, and physiology), and is not well-parameterized by offspring number alone.

Another challenge to studying CoR in men involves quantifying what constitutes the costs themselves. Epidemiological studies suggest that single and childless men across a range of social and ecological contexts have shorter life expectancies than partnered men (Hu and Goldman 1990), especially partnered fathers (Keizer et al. 2012). Similar findings have been reported when comparing married men and fathers to separated or divorced men (Hu and Goldman 1990). These findings are consistent with the net costs of mating effort being higher than parenting effort in men. However, tracking men and collecting mortality data over the livespan is logistically-challenging, time-consuming, and expensive. Furthermore, such approaches do little to shed light on the biological pathways that are thought to link partnership and fatherhood status in men to life expectancy. Studying CoR in men therefore requires a biological measure that is both capable of integrating the multifactorial nature of mating effort and capable of bridging CoR from mating effort to men’s long-term health.

Testosterone here?

A set of biological pathways that could provide new opportunities for studying CoR in men are epigenetic processes. Epigenetic processes are a key component of gene regulatory control and serve as a form of cellular memory that can persist over the lifespan. DNA methylation (DNAm) is perhaps the most well-studied epigenetic process that involves the covalent attachment of a methyl moiety to a cytosine and has been associated with a number of traits that may be related to mating effort in men. Larger body size and muscle mass are thought to be under sexual selection in men, and individual differences in DNAm in blood are associated with both height (Simeone et al. 2014) and body composition (Wahl et al., Demerath et al. 2015). Variation in DNAm in men’s blood has also been linked to sexual behavior (Bostrom et al. 2020), idiopathic infertility (Tang et al. 2018), and reproductive cancers (Goessl et al. 2006), suggesting that DNAm may provide a novel entry-point for studying CoR and health in men.

Variation in body composition and sociobehavioral dimensions of mating effort in men may be related to androgens such as testosterone (T).

CoR in women, don’t know much about them in men.

Don’t have good measures of investment

Costs may arise through T. Could be risk taking, could be metabolic, could be immunological.

Don’t have good measures of costs

#

T affects gene transcription by binding to the nuclear transcription factor androgen receptor,

T is also thought to suppress immune function, which could be a product of

Immune stuff. Tradeoffs.

Despite this, few studies have looked at T, and none within a LHT