UNIVERSITY of York

This is a repository copy of *Theorising Women's Health and health inequalities: shaping processes of the 'gender-biology nexus'*.

White Rose Research Online URL for this paper: <u>https://eprints.whiterose.ac.uk/150874/</u>

Version: Accepted Version

Article:

Annandale, Ellen Carol orcid.org/0000-0002-5305-039X, Wiklund, Maria and Hammarstrom, Anne (2019) Theorising Women's Health and health inequalities: shaping processes of the 'gender-biology nexus'. Global Health Action. 1669353. 87–96. ISSN 1654-9880

https://doi.org/10.1080/16549716.2019.1669353

Reuse

Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.



eprints@whiterose.ac.uk https://eprints.whiterose.ac.uk/

- 1 Theorising Women's Health and health inequalities: shaping processes of the 'gender-
- 2 biology nexus'
- 3
- 4 Short running title: gender, biology and health
- 5 Ellen Annandale (corresponding author)
- 6 Department of Sociology, University of York, York YO10 5DD, England
- 7 <u>ellen.annandale@york.ac.uk</u>
- 8
- 9 Maria Wiklund
- 10 Department of Community Medicine and Rehabilition, Physiotherapy
- 11 Umeå University, Sweden
- 12
- 13 Anne Hammarström
- 14 Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden
- 15 The Stress Research Institute, Stockholm University, Stockholm, Sweden
- 16
- 17
- 18 **Keywords:** biology, female genital mutilation/cutting, inequality, feminism, theoretical
- 19 20

21 Theorising Women's Health and health inequalities: shaping processes of the 'gender-

22 biology nexus'

23

24 Abstract

25

26 Since the theoretical frameworks and conceptual tools we employ shape research outcomes 27 by guiding research pathways, it is important that we subject them to ongoing critical 28 reflection. A thoroughgoing analysis of the global production of women's health inequality 29 calls for a comprehensive theorization of how social relations of gender and the biological 30 body mutually interact in local contexts in a nexus with women's health. However, to date, 31 the predominant concern of research has been to identify the biological effects of social 32 relations of gender on the body, to the relative neglect of the co-constitutive role that these 33 biological changes *themselves* may play in ongoing cycles of gendered health oppressions. 34 Drawing on feminist and gender theoretical approaches, and with the health of women and 35 girls as our focus, we seek to extend our understanding of this recursive process by 36 discussing what we call the 'shaping processes' of the 'gender-biology nexus' which call 37 attention to not only the 'gender-shaping of biology' but also the 'biologic-shaping of 38 gender'. We consider female genital mutilation/cutting as an illustration of this process and 39 conclude by proposing that a framework which attends to *both* the 'gender-shaping of 40 biology' and the 'biologic-shaping of gender' as interweaving processes provides a fruitful 41 approach to theorising the wider health inequalities experienced by women and girls.

42

43 Introduction

As Raewyn Connell recently explains, 'in an ontological sense, gender is the way human
reproductive bodies enter history, and the way that social process, unfolding through time,
deals with biological continuity' [1, p.341]. Social relations of gender interact with the

47 biological body to shape the experiences of health of men and women, boys and girls, in 48 numerous ways in manifold geographic contexts worldwide. The aim of this theoretical 49 exposition is to analyse how, within this context, feminist and gender theorists have made 50 biological 'sex' and social 'gender' legible, with the specific object of identifying lacunae in 51 their expression in a nexus with health. We begin by suggesting that the principal theoretical 52 contribution to date has been to identify how the biological body is shaped by social 53 relations of gender, or what we conceptualise here as 'the gender-shaping of biology'. We 54 then propose that, notwithstanding calls to re-examine biology in feminist terms [e.g. 2, 3, 55 4, 5, 6], the matter of how the biological body may, by its turn, express and contribute to 56 social gender dynamics in a nexus with health-or what we term the 'biologic-shaping of 57 gender'-is underexplored. Taking the 'gender-biology nexus' as our object, we put forward a 58 theoretical approach which emphasises two co-constitutive 'shaping processes': the 59 'gender-shaping of biology' and the 'biologic-shaping of gender' as they operate with 60 respect to the health and health inequalities of girls and women. To explore and illustrate 61 this in a preliminary way, we take the example of female genital mutilation/cutting. In what 62 follows we acknowledge the various meanings given to the terms 'health' and 'illness', but, 63 given our expository purpose, we generally use the term 'health' inclusively to cover both 64 positive and negative dimensions of experience.

65

66 The 'gender-shaping of biology'

As extensively rehearsed, the sex/gender distinction introduced into feminism in the 1970s
[7] had a strong and timely purpose; to challenge the pejoration of the binary script which
has fashioned woman's being as analogous to the biological body, itself conceived as
inferior to that of man. This roused the compelling argument that the causes of health/ill-

71 health globally are predominantly social and an effect of women's inequality within the 72 dominion of men. Of course the argument has never been that 'biological sex' and 'social 73 gender' bear no relationship, but rather that 'the aura of naturalness and inevitability that 74 surrounds gender-differentiation' comes [...] from the beliefs people hold about it', rather 75 than from presumed biological characteristics [7, p.189]. Even so, research has been, and 76 generally still is, targeted above all towards an examination of the influence of gender as a 77 social factor on women's bodies and their health [8]. From the 1970s onwards, ground-78 breaking social science and public health research raised two far-reaching concerns: the 79 generally higher prevalence of ill-health globally of women and girls (compared to men and 80 boys) at the individual and collective levels, and their adverse access to, and treatment in, 81 healthcare settings [e.g., 9, 10]. Anthropologists Nancy Scheper-Hughes and Margaret Lock 82 [11] have encouraged researchers to consider not only the individually experienced 'body-83 self', but also the representational symbolic power of the 'social body' to define how nature 84 and culture are thought about in a society-for our interest here, in gendered terms-and the 85 'body politic' which, through healthcare (including lay healing) and other systems such as 86 kinship, regulates both the social body and individual bodies. Stressing that gender itself is 87 global, sociologist Connell [12,1], referred to earlier, has sought to capture the relations of 88 power, production, emotion, and representation that establish the 'gender order' and the 89 institutions (e.g., healthcare) that constitute the 'gender regime' of a society. She contends 90 that as both agents and objects in reflexive practices, bodies cannot be conceived as either 91 biologically or socially determined. Here 'gendered social embodiment' occurs in a 92 structured interplay with the 'reproductive arena' where 'the reproductive possibilities of 93 human bodies are historicized; that is, given specific social forms' [13] as both 'objects of 94 social practice and agents in social practice' in a 'loop, a circuit, linking bodily processes and

95 social structures' [12, p. 67, emphasis original]. These theoretical contributions, amongst 96 others, have been effective and influential broad steers for a wealth of powerful empirical research on 'gender and health' internationally [see, for example, 14, 15, 16, 17]. However, 97 98 while the biological body is clearly a point of reference in these and other theoretical 99 contributions, it is mostly tacit. In Connell's work, for instance, bodily capacities primarily 100 appear to be 'a site where something *social* happens', such as the creation of the categories 101 'women' and 'men' [12, p 68, emphasis added]. Her illustrations of anorexia and HIV 102 transmission [13], for example, address the transformation of bodies in social embodiment, 103 but she does not intend to take up the associated biological processes in the body. Recently 104 intersectionality has gained theoretical traction as a counter to universal depictions of the 105 experiences of social groups (such as women), pointing to matrices of domination that arise 106 from complex interactions of other social structures such as age, race, class, and citizenship 107 with gender [18]. For example, with reference to global health, Anuj Kapilashrmai and Olena 108 Hankivsky [19, p.2589] have recently argued that an intersectional approach goes beyond 109 the examination of what they identify as individual factors, such as biology, socioeconomic 110 status, sex, and gender, to explore the impact that interactions among these factors have 111 upon health in a specific context. As they argue, this advances understanding of health 112 inequalities by drawing attention to differences amongst what tend to be seen as relatively 113 homogenous population groups, such as 'women', and by highlighting the interacting 114 influence of different 'multiple sites and levels of power', such as laws, institutions, and 115 structures of discrimination like sexism on health [19, p.2589]. Yet, significant though their 116 points are, and although referring to the interacting role of biology, their attention in 117 illustrations of cardiovascular disease and migration is on the influence of interacting social 118 factors with the body. Also taking an intersectional approach, but with a thoroughgoing

119 focus on gender, Kristen Springer and colleagues justly question the positing of sex and 120 gender as distinct domains, explaining instead that 'the vast majority of male-female health 121 differences are due to the effects of the irreducibility of entangled phenomena of 122 "sex/gender" and therefore that this entanglement should be theorized, modeled, and 123 assumed until proven otherwise' [20, p.1818]. Again, the foremost concern is with the 124 'material effects on the body' of 'gendered life experiences' as they 'show up' in 'biologically 125 based "sex differences" [20, p.1818, our emphasis]. They cite existing research on matters 126 such as the effects of social interaction and status differentials on neuroendocrine function 127 and psychosocial stress on cardiovascular disease, but they do not intend to detail the 128 biological processes that may be at work.

129

130 What we refer to as 'gender-shaping' also underlines psychosocial stress research. Often 131 taking its cue from endocrinologist Hans Selye's [21, p.692] definition of stress as 'the non-132 specific response of the body to any demand made upon it' (such as emotional upsets on 133 processes such as blood pressure and body temperature), research has addressed the 134 effects (implying stress arousal) of gendered life and working conditions in the biological 135 body. For example, Marianne Frankenhaeuser and colleagues [e.g., 22] have researched the 136 importance of gendered conditions in unpaid work for the differences in stress hormone 137 response between men and women in white-collar occupations. In her influential depiction 138 of 'embodiment', social epidemiologist Nancy Krieger [23, p.350] explores what bodies tell 139 us about lives by the marks left on them by the body politic through, for instance, food 140 insecurity, economic and social deprivation. To depict how biological sex and social gender 141 are, 'inextricably woven', she introduced (with Sally Zierler), the lexicon 'biologic expression 142 of gender' to characterise the incorporation of social expressions of gender into the body-

143 such as the effects of underfunding of girls' athletic programs on 'body build and exercise 144 patterns' [24, p.42, p.43] – and the companion concept, the 'gendered expression of 145 biology' 'to show 'how biologic processes influence gender roles, relations, and conditions' 146 (such as when the ability to get pregnant is used to restrict women's employment in 147 typically male and well-paid jobs, even when less well-paid jobs can be more hazardous to 148 health) [24, p.41]. Here the focus is on biological *expression*, or how our understandings of 149 the biological body are filtered through a gender lens. Subsequently Krieger [25] has drawn 150 attention to the potentially synergistic relationship between what she dubs 'sex-linked 151 biology' and 'gender relations' in health outcomes. The former depicts the reproductive 152 system, including chromosomal sex, secondary sex characteristics, pregnancy, and 153 menopause. Her proposition that 'sex-linked biological characteristics can, in some cases, 154 contribute to or amplify gender differentials in health' [25, p.653] is instructive. Her 155 examples, such as women's higher exposure to intimate partner violence-where 'sex-linked-156 biology' is set out as a determinant of strength and stamina, in interaction with 'gender 157 relations', such as men's greater likelihood of using physical violence-are astute, but it is not 158 her goal to explore the actual biological processes at work.

159

This summary, which for reasons of space cannot do justice to the now sizeable body of writing from gender and feminist thinkers on women's health within the social sciences, has highlighted how enlightening research on what we refer to as the 'gender-shaping' of the biological body has been. However, in this loosely grouped corpus of research, biology has not so much been ignored as left tacit; more tacit, we would argue, than it should be if we are to move towards a more comprehensive understanding of ongoing cycles of women's health oppressions. In a somewhat separate body of writing, feminist biologists have (as we

167 would expect) given biology a more visible analytic presence. For example, Anne Fausto-168 Sterling [26, 27] deftly explores the interweaving of bodies, disorder and culture under the 169 rubric of 'life course systems theory'/'dynamic systems theory'. She observes that since 170 social experience produces new biosocial formations, 'nothing in the body' is 'permanent 171 and unchanging' [28, p.63]. She rightly argues that temporal changes draw attention to 172 alterations both in individual biological bodies as they grow and age and the transformation 173 of social groups as experiences of earlier generations are embodied in offspring. For 174 example, in an analysis of the skeletal system and osteoporosis, she conjectures that a 175 complex of factors, including physical exercise, diet, drugs, hormones, and biomechanical 176 effects on bone formation interact through the lifecycle to influence bone density and 177 fractures, negatively affecting more women than men. She explicitly acknowledges that we 178 know relatively little scientifically about how these processes and mechanisms occur, but 179 emphasises that they transpire within 'the experiences of growing, living, and dying in 180 particular cultures and historical periods and under different regimens of social gender' [26, p.1510]. She hypothesizes, for instance, that women's more frequent dieting to lose weight 181 182 during their lifetime may contribute to lower peak bone density in adulthood compared to 183 men and hence to fractures. As this indicates, her focus is squarely upon the 'gender-184 shaping' of biology. This is further illustrated through her example [29] of the facility to 185 chose from amongst the social features of gender to embed new bodily habits, such as the 186 capacity, through practice, to alter voice register, tonality and cadence to correspond with 187 that of a typical man or woman and the embodiment of this new habit in the sensorimotor 188 (neuromuscular) system. In a landmark analysis, biologist Lynda Birke chastens fellow 189 feminists for conceptualising the body as 'the malleable surface of an internally stable 190 corporeality' [2, p.137]. Following neuroscientist Steven Rose [29], she argues that although

bodies are 'self-organising and self-determining' and sometimes 'outside of our willed
control' [2, p.169, p.85], we should conceptualize them not as 'simply *being*, but rather as *becoming*' in two-way processes throughout our lives [30, p.45, emphasis in original]. She
guides us very effectively to the fleshy, material body, but, again, we are primarily led
towards what we call the 'gender-shaping of biology' through changes within the body
resulting from social engagement [6].

197

198 Clearly the work of feminist biologists is very important. But we still have some way to go if 199 we are to move beyond the analysis of gendered narratives and representations to grasp 200 empirical data *about* the body which, as Margaret Lock and Vinh-Kim Nguyen recently put it, 201 remain black-boxed, obscuring 'the pernicious, embodied and long-term consequences of 202 social inequalities' [32, p.329]. As argued more generally by Thomas Lemke [33, p. 87], 203 amongst others, there is hesitancy amongst many feminists to engage directly with 204 'biological data and corporeal materiality of the body'. This hesitancy is explained by the 205 understandable desire to shun the hoary and truculent patriarchal equation of women and 206 girls with a defective biology which has justified women's inequality through time [8]. Thus 207 it to some extent understandable that, 'feminist-biologists' (as we conceptualise them) and 208 other researchers we have discussed seem to grapple primarily with how social processes 209 (variously conceptualised) become embodied and (potentially) generate change in the 210 biological body-itself a thorny, and certainly important, matter-to the relative neglect of 211 the even bristlier and challenging concern of the interacting role that biological changes 212 themselves might play in shaping gender in the nexus with health. But, as we now go on to 213 argue, further steps are needed to develop a theoretical framework that tightens up the 214 'gender-biology nexus' in relation to health.

215

216 The 'biologic-shaping of gender'

217 Though our conceptualization of the 'gender-shaping of biology' resonates with present 218 ways of thinking (as described above), the 'biologic-shaping of gender' is outwardly less 219 obvious in its meaning. It is therefore important to emphasise that we are not saying that 220 biology has a *determining* role, but rather that cyclical and highly complex *'shaping* 221 processes' are likely to be in play whereby biological changes—which have themselves been 222 'gender-shaped' (in the manner depicted by the existing research as discussed)-recursively 223 shape women's gender-related experiences of health ('the biologic-shaping of gender'). Hence it should also be noted that we are not suggesting, or intending to identify, a linear 224 225 'input-output' model whereby the 'inputs' of socially gendered experiences generate 226 biological changes which then 'output' to effect gendered health experiences anew, but 227 rather an imbricated and recursive process. This process is represented diagrammatically in 228 the Figure.

229

230 Figure: Shaping processes of the 'gender-biology nexus'



- 232 With the advent of 'new materialist' feminism [e.g., 6, 34, 35] over roughly the last decade,
- attention has turned more directly to the materiality of the body as 'itself an active,
- sometimes recalcitrant, force' [34, p.4]. Samantha Frost [36, p.71], for example, argues that
- 235 if feminists wish to grasp the interaction of culture and biology as 'complex, recursive, and

236 multi-linear' they must 'acknowledge that matter and biology are active in their own right'. 237 Humans, as Frost [38] relates, are 'biocultural' beings, or, as Karen Barad [35] puts it, 238 formed by 'naturalcultural' practices. The living human body comprises a multitude of 239 complex biological processes which bridge the inner body systems with the outer social and 240 gendered context, for example, through perception and cognition. As Frost [38: p. 75-6] 241 argues, bodies are responsive to their environments and 'quite literally rebuild themselves, 242 constantly, in response to the molecular constituents of their habitats'. But they are not 243 identical to their habitats since each body has been formed by its earlier biological and 244 cultural (biocultural) interchanges as well as those of previous generations. For instance, 245 research suggests that epigenetic processes may act as a channel through which social 246 environmental influences affect the body by changing gene expressions (the phenotype) 247 without changing the underlying DNA sequence (the genotype). Epigenetic changes may 248 thus alter gene expressions and modify disease susceptibility in various ways through 249 changes in the epigenome [39] which manifest in material physical form. Thus 250 environmental epigenetics highlights not only the making and remaking of bodies by their 251 environments, but also that bodies are, as Julie Guthman and Becky Mansfield argue, 252 'always active in their own remaking' [40, p.499]. Recognising that bodies and 253 social/material environments develop in relation to each other destabilises the 254 conventionally conceived social/biology border and draws attention to biological plasticity 255 [41]. Thus the body's external environments do not sit beyond it, but 'are themselves partly 256 a consequence of the organism itself as it produces and consumes the conditions of its own 257 existence' [42, p.108].

258

259 Although this way of thinking is gaining recognition, as Jörg Niewöhner and Margaret Lock 260 [43] instruct, there is a dearth of empirically-informed research in the health field to 261 illustrate just how the biological body may be actively involved in this process. This is 262 notably the case with regard to feminist work on health. As an illustration of how the 263 processes by which the biological body might not only be shaped by gender but may itself, 264 by turn, have a role in *shaping* women's experience of health/ill-health, we take female genital mutilation/cutting (FGM/C) as a case example to begin to examine the body's 265 266 biological systems and health inequality. Given the state of current scientific knowledge, this 267 case is offered in a preliminary and tentative fashion.

268

269 The case of FGM/C

270 Identified by the United Nations as a human rights violation affecting girls and women 271 worldwide, FGM/C is especially concentrated in a swath of countries from the Atlantic coast 272 to the Horn of Africa, in areas of the Middle East, and in some countries of Asia. The WHO 273 defines the practice as comprising 'all procedures that involve partial or total removal of the 274 external female genitalia, or other injury to the female genital organs for non-medical 275 reasons' [44]. By recognising that 'FGM is an act that cuts away equality' [45], the most 276 recent UN-sponsored International Day of Zero Tolerance 2018 underscored the association 277 of FGM and gender inequality. Worldwide, in countries where it is prevalent, 200 million 278 girls and women alive today have been cut, with 3.2 million cut annually [45, 46, 47, 48]. 279 Prevalence varies considerably across countries. Secular trend analysis shows some 280 significant shifts downwards in prevalence over the last twenty to thirty years in some 281 regions, such as East Africa, which according to Demographic Health Survey (DHS) data, saw 282 a reduction in prevalence from 71.4% in 1995 to 8.0% in 2016 [49]. However, UNFPA [47]

predicts (also based on DHS data) that due to underlying population growth in girls under
 age 25, the number of women affected will increase significantly by 2030 in countries where
 FGM/C is prevalent.

286 FGM/C is not only a practice, traceable back thousands of years, but also an object of 287 political debate within contemporary feminism and beyond [e.g., 50], making it in Hilary 288 Burrage's [51] words, a moral maze. UNICEF, for example, has employed both the more 289 politically neutral FGM/C (female genital cutting) and FGM [46, 52]. Since we cannot do 290 justice to political debates here, which, although important, are not essential to our 291 purpose, we opt to use the broader term FGM/C. FGM/C is an expression of gender 292 inequality and a form of violent abuse within patriarchal societies past and present[see e.g., 293 51, 53]. FGM/C's persistence is often associated with entrenched socio-cultural norms. As a 294 cultural and political marker of inside/outsider status for girls and women, it often 295 symbolises cleanliness, purity, an appropriate embodied femininity and entry into 296 womanhood and is seen to improve fertility and marriageability [51, 54, 55]. Social 297 exclusion, shame and stigma often result if a girl is not cut [50, 52, 56]. Associations are 298 often drawn between FGM/C and the Islam since it is well-established in many 299 predominantly Islamic societies (such as in sub-Saharan Africa), yet not all Islamic groups 300 engage in the practice while many non Islamic groups do (it is practised amongst the 301 Christian and Jewish faiths, for example). As Burrage [51] relates, FGM/C is axiomatic to no 302 world religion, yet in various times and place various religious faiths have practised it and 303 patriarchal religions arguably create the milieu which allow the practice to continue. 304

Although the genito-urinary effects of FGM/C, such as effects on sensibility and sexual
 pleasure, painful neuromas, micturition difficulties, menstrual, and obstetric complications

307 are fairly well-documented [e.g., 57, 58], in-depth studies of how these complications are 308 embodied and experienced throughout the lives of women are few in number, undoubtedly 309 because of the not inconsiderable practical challenge of conducting research on the matter. 310 Long-term bodily consequences of FGM/C may extend beyond the reproductive system, 311 involving, for instance, intestine and urinary bladder dysfunction and long-term pain and 312 complications [59], as well as somatic complaints; that is, symptoms with no identifiable 313 organic cause, such as aches and pains, and also significant mental health problems, 314 including depression, anxiety, and PTSD [60, 61, 62].

315

316 To refer back to our Figure, throughout our discussion thus far we have focused primarily on 317 one facet of the 'shaping process' within the 'gender-biology nexus'; namely, the 'gender-318 shaping of biology'. In the reciprocal process of 'biologic-shaping of gender' we attend to 319 how the experience of women and girls may *alter* in complex embodied interactions with 320 biological changes in the body. By definition, when referring to *female* genital mutilation/cutting, it is important that we include 'sex' because only the biological sex 321 322 organs of girls and women i.e., the vulva (clitoris, labia majora, labia minora are exposed to 323 trauma. While it can be noted that male circumcision (cutting of the prepuce, or foreskin) 324 and can also carry health risks (though these are not high) such as haemorrhage and 325 bleeding and erectile dysfunction [63], and that some argue that we should problematise 326 male circumcisions as a routine practice and its association with understandings of the male 327 body and masculinity [64], this is not addressed here as our focus is on women and girls. 328 Though not referring to FGM/C, Jörg Niewöhner and Margaret Lock argue that bodily 329 sensation and experience is 'in part formed by the material body, itself contingent on 330 evolutionary, environmental, social and individual variables' [43, p.684, our emphases]. The

331 consequences of these 'variables', as Niewöhner and Lock express it, are illustrated in 332 research by Anke Köbach and colleagues [60] with women in Jijiga, the capital of the Somali 333 region of Ethiopia where FGM/C has been widespread. Their analysis is based on a 334 convenience sample (without a control group) and comprises self-reported information 335 gleaned from women in interview (with clinical psychologists) about FGM/C, including 336 experience of the cutting, subsequent short and long-term physical complications, and 337 validated measures of PTSD and other mental health problems. From their analysis the 338 authors identified associations between the most severe kinds of cutting (types II and III) 339 and psychopathological symptoms in adulthood, especially vulnerability to PTSD and 340 shutdown dissociation. They also found higher hair cortisol concentrations (an indicator of 341 hormone response to stress) in women who experienced FGM/C before their first year of 342 age or had more severe forms of FGM compared to rest of the women, which indicates 343 long-term neuroendocrinological consequences of FGM and trauma in general on the 344 central stress system (the hypothalamic-pituitary-adrenal axis, or HPA). Since the HPA axis 345 genes play an important role in regulating the impact of social and environmental stress, 346 Köbach et al. draw attention to the possibility that the trauma from experiencing cutting 347 may have epigenetic effects. That traumas during a critical age period of epigenetic 348 plasticity in early life (as Köbach et al.'s [60] respondents' experienced) may lead to 349 epigenetic processes is suggested by animal studies [65] and has been proposed as a 350 framework for epigenetic modifications in the biological integration of socioeconomic 351 factors during life. Research indicates that early egregious trauma (such as abuse in 352 childhood and other sorts of early-life stress among humans) may lead to dysregulation of 353 the HPA axis and later life mental ill health [66] as well as other health problems, such as 354 cancer and cardiovascular disease [e.g., 67, 68, 69]. Thus we can situate, albeit tentatively

355 (since, as noted, research is very limited at present), findings about FGM/C within the 356 hypothesized associations between stress-induced epigenetic modifications located in early 357 stressful life events during childhood and later life health inequalities in the manner 358 suggested as possible for socio-economic differentials [see e.g., 68, 70]. In our case 359 illustration, possible epigenetic effects reveal that the 'gender-shaping of biology' (taking 360 FGM/C to be the effect of women's environmental and social inequality) appears to 361 entangle with neuroendocrinological changes which 'biologically-shape' (but do not 362 determine) the health of girls and women exposed to FGM/C, which can be conceptualised 363 as a form of gendered health inequality. To explore this 'biologic-shaping of gender' in 364 relation to FGM/C further, we draw now on the work of Gillian Einstein [71, 72], a biologist 365 with a doctorate in neuroanatomy, who explores the neurobiological repercussions of 366 FGM/C from a feminist perspective.

367

368 Focusing on FGM/C type III (infibulation, excision of the external genitalia with closure of 369 the introitus) [62], Einstein proposes that cutting of the efferents and afferents (nerve 370 circuits) carried in the pudental, pelvic and hypogastric regions may affect the rest of the 371 body via the central nervous system (CNS) which, along with others [e.g., 73], she describes 372 as 'sensitive and malleable' [72, p.171]. She takes FGM/C's effects not in isolation and as 373 affecting one part of the body (the reproductive system), but as 'owned by the entire body, 374 or embodied through the interconnections of all body systems and the environment' [72, 375 p.158]. In an expressly speculative analysis she suggests that since the tissue of the vulva is 376 highly innervated, cutting the nerves which supply the skin and muscle will affect the feed-377 back processes of the central nervous system and rouse long-lasting, body-wide effects such 378 as referred sensations, including pain (referred sensation means a sensation perceived at

another location than the site of the stimuli causing the sensation). The spinal cord and brain
may respond to cutting with reorganization ('rewiring') of neural circuits by referred
sensations (The neurological tissues can react to bodily losses akin to the way in which,
upon the amputation of a leg, a person may still feel the sensation of parts of the lost leg or
feelings of pain in the lost leg–a phenomenon called phantom sensation or phantom pain.
Einstein [71] suggests similarly that women exposed to FGM/C may experience phantom
sensations or clitoral pain.

386

387 Extrapolating from Einstein's arguments, while the (new) biological changes to the body 388 may shape physical sensations after having been cut, we would not expect them to 389 determine sensate experience in any simple or universal way because women's 390 interpretations of and responses to biological change are situated in time and place and 391 therefore formed by local expectations and practices. To deploy anthropologist Margaret 392 Lock's [74] well-known concept of 'local biologies', the shaping processes that we highlight 393 here are contingent and experienced in specific gendered environments. According to 394 Einstein [71, 72], it is reasonable to argue that as it is affected by other bodily modifications, 395 the CNS itself 'plays a role in the embodiment of culture' [72, p.155] with potential 396 gendered consequences for both the bodies and minds of women and girls. Thus she 397 proposes that cutting not only makes girls and women resemble their community physically 398 (which is likely to be normatively valued), 'through its actions on the CNS it inscribes values 399 of comportment and aesthetics' [71, p.94]. Thus she relates that FGM/C 'configures the 400 ways in which a woman carries herself, walks, and experiences the world' [71, p.94]. By this 401 we may infer that a new collective and individual mind-body is produced. First-person 402 experiential accounts provide support for this. Waris Dirie [75] and Hibo Wardere [56], for

403 instance, explain how their physical bodies changed after cutting and the horrific pain when 404 urinating and the nightmare of menstrual periods after being cut as young girls. Reflecting 405 back on the impact of biological change on her life as a girl, Wardere laments, 'no more 406 running, skipping or jumping rope for me' [56, p.223]. Similarly, in research by Morison and 407 colleagues [76], Somalis living in London spoke of direct effects of cutting which involved 408 walking and behaving differently to avoid opening up scars. This conjures political scientist 409 Iris Marion Young's [77] classic discussion of female comportment. Less open than men in 410 gait and stride, Young argues that 'modalities of female bodily existence' are rooted in 411 experience of the body as a 'fragile thing, which must be picked up and coaxed into 412 existence' [77, p.39]. Perforce, women who have been cut may realise pain, distress, and 413 constricted physicality, but as this usually is all they and those around them know, over time 414 and through generations, as Einstein explains, experiential changes may become 415 'instantiated as the "normal" (and perhaps, desirable) body' [72, p. 151; see also, 78] and 416 hence part of the experience of womanhood [56, 75]. Research with Somali-Canadian 417 women, for example, has shown that wide-scale bodily pain and discomfort can be brushed-418 aside as normal-natural as women exhibit resilience through the desire not to let pain attain 419 power over their lives [71, 72, 78]. Nevertheless, as Johansen [79] explores, the pain of 420 infibulation has lasting effects, which Somali refugee women in her Norwegian study spoke 421 of as 'embodied memory' carried with them as a burden and sense of loss. This then points 422 to how shaping processes; the intertwined 'gender-shaping of biology' and consequent 423 'biologic-shaping of gender' through time, may produce a new collective and individual 424 mind-body, as noted earlier.

425

426 To return explicitly to our Figure, while the origins of FGM/C are indisputably social and 427 seated in localised social relations of gender ('gender-shaping of biology'), they may effect 428 complex and perhaps far-reaching changes in the material biological body. The body 429 becomes other than what it once was (or could have been); it is altered. Through our 430 illustration, we have sought to open up black-boxed data about the body which obscures 431 the harmful embodied and long-term consequences of social inequalities [43] by bringing to 432 light the epigenetic and neurobiological processes through which changes may occur. These 433 bodily changes by their turn entwine with (but do not determine) women's individual and 434 collectively gendered bodily expressions and experiences (the 'biologic-shaping of gender') 435 which are unlikely to be universal, but rather to vary by time and place. It is important to 436 stress that by this argument we do not intend to say that the biological and the social are 437 one and the same, collapsed into one another or, as noted earlier, that a linear 'input-438 output' process is in play, but rather that gender-suffused social milieu-which encompass, 439 for example, the health, life and experiences of our illustration-become sedimented (but 440 not ineludibly fixed) in bodily practices which concern women's health as individual and 441 collective lives evolve in time.

442

443 Implications for policy

As remarked upon at the start, it is important that theoretical frameworks and conceptual tools are subject to ongoing critical analysis because they shape research outcomes by guiding research pathways. A thoroughgoing analysis of the global production of women's health inequality depends on a comprehensive theorization of how social relations of gender and the biological body mutually inform each other in local contexts. To pick up on the recent statement referred to earlier from UN Women [45] that 'FGM is an act that cuts

450 away equality', we argue that a comprehensive understanding of what this means for 451 women's health calls for us to go beyond the common concern with how social and cultural 452 practices shape the biological body-important though this, of course, is - to also attend to 453 the recursive effects of the biological changes themselves on women's social lives and lived 454 bodily experiences. Yet we very quickly reach the limits of our empirical knowledge when 455 we try to develop this more comprehensive approach. A primary reason for this is the 456 distinct lack of interdisciplinary research. While feminist and gender theorists have begun to 457 explore the biological substance of the body as active, rather than passive, matter (such as 458 in materialist feminism e.g., 35, 38], they have not directly engaged with health experiences 459 associated with inequality for women and girls. Even in the field of FGM/C, for example, 460 there is a paucity of in-depth qualitative research exploring embodied experience. Thus a 461 recommendation made here, which accords more generally with those made in the wider 462 context of women's health [e.g., 80, 81], is that research funding bodies and institutions 463 recognise the value of interdisciplinary theoretical and empirical research in the field 464 commonly known as 'gender and health' that addresses not only the 'gender-shaping of 465 biology' but also the 'biologic-shaping of gender' and which avoids essentialist and 466 reductivist thinking.

467

468 **Conclusion**

In this theoretical paper we have sought to explore how social relations of gender
interrelate with the biological body to shape the experience of health in ways that may
generate inequality for women and girls. Specifically we have analysed how feminist and
gender theorists have made biological 'sex' and social 'gender' legible, with the specific
object of identifying gaps in their expression in a nexus with health. We have argued that, to

| 474 | date, most attention has been directed to what we call the 'gender-shaping of biology' to |
|-----|---|
| 475 | the relative neglect of the co-constitutive role that biological changes themselves-what we |
| 476 | dub the 'biologic-shaping of gender'-may play in ongoing cycles of gendered health |
| 477 | inequality. FGM/C has been taken to explore in a preliminary way how these 'shaping |
| 478 | processes' may occur. It is recognised, however, that we are limited in our capacity to fully |
| 479 | substantiate what we conceptualise as the shaping processes of the 'gender-biology nexus' |
| 480 | (focusing on health and illness) at the present due to lack of research. In order for this to |
| 481 | progress, we suggest that far more interdisciplinary research between social scientists, |
| 482 | including gender theorists, and biological and health scientists is needed. |
| 483 | |
| 484 | End Materials |
| 485 | Acknowledgements: N/A |
| 486 | Author contributions: EA took primary responsibility for writing and revising the manuscript. |
| 487 | All authors contributed to developing and revising the manuscript. All authors read and |
| 488 | approved the final manuscript. |
| 489 | Disclosure Statement: None of the authors have any competing interest. |
| 490 | Ethics and consent: N/A |
| 491 | Funding Information: The research was funded by The Swedish Research Council dnr 344- |
| 492 | 2011-5478. |
| 493 | Paper context: Analyses of the relationship between social and biological factors in the |
| 494 | production of women's health inequality have focused predominantly on how social factors |
| 495 | become embodied to the relative neglect of the reciprocal role played by the biological body |
| 496 | in shaping its social world. Drawing on feminist and gender theory we develop a novel |

- 497 theoretical approach which attends not only to the 'gender-shaping of biology' but also to
- 498 the 'biologic-shaping of gender' as interweaving processes.
- 499 ORCHID Ellen Annandale <u>http://ochrid.org/0000-0002-5305-039X</u> Maria Wiklund
- 500 <u>http://orchid.org/0000-0001-5965-5368</u> Anne Hammarström <u>http://orchid.org/0000-0002-</u>
- 501 <u>4095-7961</u>
- 502 **References**
- 503 [1] Connell R. Conclusion: reckoning with gender. In: Messerschmidt JW, Martin PY, Messner
- 504 MA, Connell R, editors. Gender reckonings. New York (NY): New York University Press; 2018.
- 505 p. 331-346.
- 506 [2] Birke L. Feminism and the biological body. New Brunswick: Rutgers University Press;
- 507 1999.
- 508 [3] Fausto-Sterling A. Sexing the body. New York (NY): Basic Books; 2000.
- 509 [4] Pitts-Taylor V. Mattering: feminism, science, and corporeal politics. In: Pitts-Taylor V,
- 510 editor. Mattering New York (NY): New York University Press; 2016a. p.1-20.
- 511 [5] Pitts-Taylor V. The Brain's body. Neuroscience and corporeal politics. Durham:Duke
- 512 University Press; 2016b.
- 513 [6] Wilson E. Gut Feminism. Durham: Duke University Press; 2015.
- 514 [7] Oakley A. Sex, gender and society. London:Temple Smith; 1972.
- 515 [8] Annandale E. Women's health and social change. London: Routledge; 2009.
- 516 [9] Roberts H, editor. Women, health and reproduction. London: Routledge, Kegan Paul;
- 517 1981.
- 518 [10] Doyal L. What makes women sick. London: Macmillan; 1995.
- 519 [11] Scheper-Hughes N, Lock, M. The mindful body: a prolegomenon to future work in
- 520 medical anthropology. Med Anthropol Q. 1987;1(1):6-41.

- 521 [12] Connell R. Gender. Cambridge: Polity; 2009.
- 522 [13] Connell, R. Gender, health and theory: conceptualizing the issue, in local and world
- 523 perspective. Soc Sci Med. 2012;74(11):1675-1683.
- 524 [14] Bird CE, Rieker PP. Gender and health: The effects of constrained choices and social
- 525 policies. New York (NY): Cambridge University Press; 2008.
- 526 [15] Wiklund M, Bengs C, Malmgren-Olsson EB, et al. Young women facing multiple and
- intersecting stressors of modernity, gender orders and youth. Soc Sci Med. 2010;71(9):1567-1575.
- 529 [16] Herrett M, Schofield T. Raewyn Connell: gender, health and healthcare. In: Collyer F,
- 530 editor. The Palgrave handbook of social theory in health, illness and medicine. London:
- 531 Palgrave; 2015. p. 550-566.
- 532 [17] Wiklund M, Ahlgren C, Hammarström, A. Constructing respectability from disfavoured
- 533 social positions: exploring young femininities and health as shaped by marginalisation and
- social context. A qualitative study in Northern Sweden. Glob Health Action. 2018;
- 535 11(sup3):1519960.
- 536 [18] Misra J. Categories, structures and intersectional theory. In: Messerschmidt JW, Martin
- 537 PY, Messner MA, Connel R. editors. Gender reckonings. New York (NY): New York University
- 538 Press; 2018. p 111-130.
- 539 [19] Kapilashrami A, Hankivsky O. Intersectionality and why it matters to global health. The
- 540 Lancet.. 2018; 391:2589-2591.
- 541 [20] Springer K, Mager Stellman J, Jordan-Young R. Beyond a catalogue of differences: a
- 542 theoretical frame and good practice guidelines for researching sex/gender in human health.
- 543 Soc Sci Med. 2012;74(11):1817-1824.
- 544 [21] Selye H. The evolution of the stress concept. Am Sci. 1973;61(6):692-699.

- 545 [22] Frankenhaeuser M, Lundberg U, Fredrickson M, et al. Stress on and off the job as
- 546 related to sex and occupational status in white-collar workers. J Organ Behav.
- 547 1989;10(4):321-346.
- 548 [23] Krieger N. Embodiment: a conceptual glossary for epidemiology. J Epidemiol Commun
- 549 H. 2005; 59(5):350-355.
- 550 [24] Krieger N, Zierler H. Accounting for the health and women. Crit Public Health. 1997;7(1-551 2):38-49.
- 552 [25] Krieger N. Gender, sexes, and health: what are the connections and why does it
- 553 matter? Int J Epidemiol. 2003; 32:652-657.
- 554 [26] Fausto-Sterling A. The bare bones of sex: part 1 sex and gender. Signs. 555 2005;30(2):1491-1528.
- 556 [27] Fausto-Sterling A. Sex/gender: biology in a social world. London: Routledge; 2012.
- 557 [28] Fausto-Sterling A. Against dichotomy. Evolutionary Studies in Imaginative Culture.
- 558 2017; 1(1):63-66.
- 559 [29] Fausto-Sterling A. Gender/sex, sexual orientation, and identity are in the body: how did
- 560 they get there. J Sex Res. 2019;56(5-6):529-555.
- 561 [30] Rose S. Lifelines: biology, freedom, determinism. Harmondsworth: Penguin; 1997.
- 562 [31] Birke L. Shaping biology. In: Williams S, Birke L, Bendelow G, editors. Debating biology.
- 563 London: Routledge; 2000. p.39-52.
- 564 [32] Lock M, Nguyen V-K. An anthropology of biomedicine. 2nd ed. Oxford: Wiley-Blackwell;565 2018.
- 566 [33] Lemke T. Mater and matter: a primary cartography of material feminisms. Soft Power.
- 567 2017;5(1):83-100.

- 568 [34] Alaimo S, and Hekman S, editors. Material feminisms. Bloomington Indiana: University
 569 of Indiana Press; 2008.
- 570 [35] Barad K. Meeting the universe halfway. Durham: Duke University Press; 2007.
- 571 [36] Frost S. The implications of the new materialisms for feminist epistemology. In:
- 572 Grasswick HE, editor. Feminist epistemology and philosophy of science: power in
- 573 knowledge. Springer: Switzerland AG; 2011. p. 69-83.
- 574 [37] Coole D, Frost S, editors. New materialisms. Durham: Duke University Press; 2010.
- 575 [38] Frost S. Biocultural creatures. London: Duke University Press; 2016.
- 576 [39] Skinner MK. Environmental epigenomics and disease susceptibility. EMBO Rep. 2011;
- 577 12(7):620-2.
- 578 [40] Guthman J, Mansfield B. The implications of environmental epigenetics: A new
- 579 direction for geographic inquiry on health, space, and nature-society relations. Prog Hum
- 580 Geog. 2012;37(4): 486-504.
- 581 [41] Meloni M, Testa G. Scrutinising the epigenetics revolution. In: Meloni M, Cromby J,
- 582 Fitzgerald D, Lloyd S, editors. The Palgrave handbook of biology and society. London:
- 583 Palgrave; 2017. p.191-226.
- 584 [42] Weasel L. Embodying intersectionality: the promise (and peril) of epigenetics for
- 585 feminist studies of science. In: Pitts-Taylor V, editor. Mattering. New York (NY):New York
- 586 University Press; 2016. p.104-121.
- 587 [43] Niewöhner J, Lock M. Situating local biologies: anthropological perspectives on
- 588 environment/human entanglements. BioSocieties. 2018;13(4):681-697.
- 589 [44] WHO. Female Genital Mutilation. Key Facts. 2018 [cited 2019 Aug 30]. Available from:
- 590 <u>https://www.who.int/news-room/fact-sheets/detail/female-genital-mutilation</u>.

- 591 [45] UN Women. International Day of Zero Tolerance to Female Genital Mutilation. 2018.
- 592 [cited 2018 Nov 24]. Available from:
- 593 <u>http://www.unwomen.org/en/news/stories/2018/2/statement-ed-phumzile-international-</u>
- 594 <u>day-of-zero-tolerance-for-fgm</u>.
- 595 [46] UNICEF. Female genital mutilation. 2018. [cited 2018 Dec 10]. Available from:
- 596 <u>https://data.unicef.org/topic/child-protection/female-genital-mutilation/</u>
- 597 [47] UNFPA. Bending the Curve: FGM trends we aim to change. 2018.
- 598 <u>https://www.unfpa.org/resources/bending-curve-fgm-trends-we-aim-change</u>
- 599 [48] WHO. Resolution adopted by the General Assembly on 18 December 2014. 69/150.
- 600 Intensifying global efforts for the elimination of female genital mutilations. 2014. [2018
- 601 cited Nov 4]. Available from:
- 602 <u>http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/69/150</u>
- 603 [49] Kandala N-B, Ezejimofor MC, Uthman OA, Komba P. Secular trends in the prevalence
- 604 of female genital mutilation/cutting among girls: a systematic analysis BMJ Global
- 605 Health. 2018;**3**:e000549.
- 606 [50] Jordal M, Griffin G. Clitoral reconstruction: understanding changing gendered health
- 607 care needs in a globalized Europe. Eur J Womens Stud. 2018; 25(2):154-167.
- 608 [51] Burrage H. Eradicating FGM. London: Routledge; 2015.
- 609 [52] UNICEF. Female Genital Mutilation/Cutting: A statistical overview and exploration of
- 610 the dynamics of change. New York: UNICEF; 2013.
- 611 [53] Mwanri L, Gatwiri GJ. Injured bodies, damaged lives: experiences and narratives of
- 612 Kenyan women with obstetric fistula and female genital mutilation/cutting. Reprod Health.
- 613 2017;14:38. <u>https://reproductive-health-</u>
- 614 journal.biomedcentral.com/track/pdf/10.1186/s12978-017-0300-y

- 615 [54] Sagna M. Gender differences in the support for discontinuation of female genital
- 616 cutting in Sierra Leonne. Cult Health Sex. 2014;16(6):603-619.
- 617 [55] O'Neill S. Purity, cleanliness, and smell: female circumcision, embodiment, and
- 618 discourses among midwives and excisers in Fouta Toro, Senegal. Journal of the Royal
- 619 Anthropological Institute. 2018;24(4):730-748.
- 620 [56] Wardere H. Cut. London: Simon & Schuster; 2016.
- 621 [57] Andro A, Cambois E, Lesclingand, M. Long-term consequences of female genital
- 622 mutilation in a European context: self perceived health of FGM women compared to non-
- 623 FGM women. Socl Sci Med. 2014;106:177-184.
- 624 [58] Klein E, Helzner E, Shayowitz M, et al. Female genital mutilation: health consequences
- 625 and complications—a short literature review. Obstetrics and Gynecology International.
- 626 2018; <u>https://www.hindawi.com/journals/ogi/2018/7365715/</u>
- 627 [59] Berg RC, Underland V, Odgaard-Jensen J, et al. Effects of female genital cutting on
- 628 physical health outcomes: a systematic review and meta-analysis. BMJ Open. 2014;
- 629 <u>https://bmjopen.bmj.com/content/4/11/e006316</u>
- 630 [60] Köbach A, Ruf-Leuschner R, Elbert T. Psychopathological sequelae of female
- 631 genital mutilation and their neuroendocrinological associations. BMC Psychiatry. 2018;
- 632 18:187 <u>https://doi.org/10.1186/s12888-018-1757-0.</u>
- 633 [61] WHO. WHO guidelines on the management of health complications from female
- 634 genital mutilation. Geneva, WHO; 2016.
- 635 <u>https://www.who.int/reproductivehealth/topics/fgm/management-health-complications-</u>
 636 <u>fgm/en/</u>
- 637 [62] WHO. Care of Girls and Women Living with Female Genital Mutilation. A Clinical
- 638 Handbook. Geneva: WHO; 2018.

- 639 [63] Paakkanen, EK. Entitled, powered or victims-an analysis of discourses on male and
- 640 female circumcision, genital mutilation/cutting and genital cosmetic surgery. International
- 641 Human Rights. DOI: <u>10.1080/13642987.2019.1612375</u>; **2019**
- 642 [64] Fox M, Thomson M. Foreskin is a feminist issue. Aust Feminist Stud. 2009; 25(60):195-
- 643 **201**.
- 644 [65] Lee RS, Sawa A. Environmental stressors and epigenetic control of the hypothalamic-
- 645 pituitary-adrenal axis. Neuroendocrinology. 2014;100(4):278-287.
- 646 [66] Van Voorhees E, Scarpa, A. The effects of child maltreatment on the hypothalamic-
- 647 pituitary-adrenal axis. Trauma Violence Abus. 2004; 5(4):333-52.
- 648 [67] Daskalakis NP, Yehuda R. Programming HPA-axis by early life experience: mechanisms
- 649 of stress. Front Endocrinol. 2015;
- 650 https://www.frontiersin.org/articles/10.3389/fendo.2014.00244/full
- 651 [68] Stringhini S, Vineis P. Epigenetic signatures of socioeconomic status across the
- 652 lifecourse. In: Meloni M, Cromby J, Fitzgerald D, Lloyd S, editors. The Palgrave handbook
- of biology and society. London:Palgrave; 2017.p:541-589.
- 654 [69] Kelly-Irving M, Delpierre C. The embodiment dynamic over the life course: a case for
- 655 examining cancer aetiology. In: Meloni M, Cromby J, Fitzgerald D, Lloyd S, editors. The
- 656 Palgrave handbook of biology and society. London: Palgrave; 2017. p.519-540.
- 657 [70] Thayer ZM, Kuzawa CW. Biological memories of past environments: epigenetic
- 658 pathways to health disparities. Epigenetics. 2011;6(7):1-6.
- [71] Einstein G. From body to brain: considering the neurobiological effects of female genital
- 660 cutting. Perspect Biol Med. 2008;51(1):84-97.
- [72] Einstein G. Situated neuroscience: exploring biologies of diversity. In: Bluhm R, Jaap
- Jacobson A, Mailbom HL, editors. Neurofeminism. London:Palgrave; 2012.p:145-174.

- 663 [73] Papadopoulos D. The imaginary of plasticity: neural embodiment, epigenetics and
- 664 ecomorphs. Sociolog Rev 2011;59(3):232-456.
- 665 [74] Lock M.The tempering of medical anthropology: troubling natural categories. Med
- 666 Anthropol Q. 2001;15(4):478-492.
- 667 [75] Dirie W. Desert flower. London: Virago; 2001.
- 668 [76] Morison L, Dirir A, Elmi S, et al. How experiences and attitudes relating to female
- 669 circumcision vary according to age on arrival in Britain. Ethnic Health. 2004;9(1):75-100.
- 670 [77] Young I. Throwing like a girl. In: Young IM, editor. On female body experience. Oxford:
- 671 Oxford University Press; 2005.p.27-45.
- [78] Jacobson D, Glazer E, Mason R, et al. The lived experience of female genital cutting
- 673 (FGC) in Somali-Canadian women's daily lives. PLoS one. 2018; 13(11).
- 674 <u>https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0206886</u>
- 675 [79] Johansen REB. Pain as a counterpoint to culture: toward an analysis of pain associated
- with infibulation among Somali immigrants in Norway. Med Anthropol Q. 2002; 16(3):312-
- 677 **340**.
- [80] Rieker P, Bird C. Rethinking gender differences in health: why we need to integrate
- 679 social and biological perspectives. The Journals of Gerontology. 2005; Series B. 60 (special
- 680 issue 2):S40–S4.
- [81] Sharman Z, Johnson J. Towards the inclusion of gender and sex in health research and
- 682 funding: An institutional perspective. Soc Sci Med. 2012;74:1812-1816.