

1 'The Unhealthy Other': How vaccine rejecting parents construct the 2 vaccinating mainstream

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12 13 14 **Introduction**

15 Parents' decisions to reject vaccines pose a significant public health problem in many parts of
16 the developed world. Researchers looking for solutions increasingly recognize that parental
17 decisions around vaccination are not purely individual choices, but social ones [1-3]. Social
18 context matters greatly to parents' decisions, as does their understanding of their place within
19 broader groups, communities and societies. This article examines how vaccine rejecting (VR)
20 parents socially construct the vaccinating mainstream in opposition to themselves [4, 5].
21 Applying insights from Social Identity Theory (SIT) to interviews with VR parents, we show
22 how these parents bolster their own sense of identity and self-belief by a discourse that casts
23 vaccinators as an Unhealthy Other. They identify vaccination as a marker of parental
24 conformity to the 'toxic practices of mass industrial society', linking it to other ways in which
25 membership of the consumerist mainstream requires individuals to 'neglect their health'.

26 Other scholars have identified vaccine rejecting parents' perceptions that their caregiving
27 practices are superior to those of others, who may consequently suffer illness or even benefit

28 from vaccines [6-9]. Amongst Elisa Sobo's extensive contribution to the field is the
29 consideration that 'opting out' of vaccination may be first and foremost an act of 'opting in'
30 to a particular community [2]. We build on the work of these peers to explain and illustrate
31 how construction of an Unhealthy Other elevates the self-concept of VR parents, who see
32 themselves as part of an enlightened, but constantly besieged, group of healthy and virtuous
33 parents, and to offer a theoretical basis for how this may reinforce their decisions not to
34 vaccinate.

35 Recent research has established that VR parents engage in specific behaviours oriented
36 around 'the natural' that, in their view, negate the need for them to vaccinate their children
37 [7, 10-13]. Reich attributes this to a confluence of 'healthism' [14] and parenting
38 philosophies that hold parents highly accountable for the wellbeing of their children [7].
39 Parents may, therefore, reject vaccines as part of a lazy 'quick fix' and pursue, instead, more
40 holistic approaches to health that allow them to take personal responsibility as a result of
41 having 'educated' themselves [9, 15, 16]. Elsewhere, we have built on Antonovsky's concept
42 of 'salutogenesis' [17], a health promotion philosophy designed to maintain a body
43 undergoing inevitable decay, to show how parents perceive practices such as eating organic
44 food, eschewing 'chemicals', and pursuing alternative schooling and complementary and
45 alternative medicine (CAM) make parents feel safe and responsible for their children's health
46 and well-being [16, 18]. Responsibilised and armed with a clear ethos, VR parents have a
47 self-perceived clear, logical and internally justifiable rationale for their self-identification as a
48 social group [16, 18]. What merits further attention is how they construct an identity for
49 'other' parents who follow mainstream health and lifestyle practices, and how this informs
50 their own self-perception. By analysing this phenomenon we hope to improve vaccine
51 communications and delivery across cultural divides.

52 Social Identity Theory (SIT) and its progeny, Self-Categorisation Theory (SCT), illuminate
53 how non-vaccinators’ discursive construction of the vaccinating mainstream forms part of
54 their identification process. SIT and SCT have been developed by social psychologists over
55 many years in experimental settings [19-21]. SIT posits that individuals strive for a positive
56 self-concept, which can be derived from identification with groups they value highly. SCT
57 shows that individuals understand their social “ingroup” by contrast to “outgroups”, and that
58 they accentuate the similarities within their group and the differences to those outside it [22,
59 23]. One way individuals may enhance the esteem of their ingroup is to denigrate outgroups
60 [19, 24]. SIT holds that the stereotypes informing these group processes are not simply
61 “faulty distortions” in cognition [25]. Stereotyping of others is a means by which group
62 members make sense of the world outside their group and justify their own actions, which
63 Tajfel called the “ideologizing function” of stereotypes [26]. Here, we suggest that the
64 negative stereotypes of the Unhealthy Other reinforce our participants’ decisions not to
65 vaccinate, by increasing the value of the group to which they belong. It is common for the
66 vaccinating mainstream to present VR parents as a group subject to epistemic closure,
67 groupthink, confirmation bias and over-confidence in their own expertise [27]. However, it is
68 vital to understand that VR parents also see mainstream society as a group—a much larger
69 one—subject to the same problems.

70 **2. Methods** Researchers advertised the study and approached potential participants at an
71 organic market in Adelaide, South Australia, who self-identified as being vaccine hesitant.
72 Participants were asked to share Information Sheets with other parents in their networks, who
73 then contacted the researchers to be interviewed. Following explanation of the study and the
74 provision of informed consent, 20 interviews were conducted by a research assistant. A list of
75 indicative topics informed semi-structured questions and probes regarding beliefs, attitudes
76 and practices around illness and health, social networks, information sources, political

77 persuasions and how these interacted with vaccination decisions. Interviews lasted
78 approximately an hour, and were audio recorded and transcribed in full. Interviews continued
79 until data saturation was met.

80 The sample included 10 parents who had never vaccinated their children, 5 who had ceased, 2
81 who were selectively vaccinating and 3 who had delayed but were now up to date. Such
82 diversity was not explicitly sought, but expected on the basis that ‘vaccine hesitancy’ has
83 been used to cover a range of beliefs and behaviours [28, 29]. While all transcripts were
84 analysed for this study, almost all the respondents cited were currently eschewing all
85 vaccines. Demographically, all but three participants were women. They had individual
86 incomes ranging from \$15,000 a year to above \$150,000 a year, reflecting a diverse range of
87 occupations, from combining parenting with yoga teaching and massage to professions
88 including project management and psychology. Participants were aged between 36 and 50.
89 Half had a university qualification, others had vocational diplomas or were currently
90 studying. Eight identified as Greens voters, one supported the centre-left Labor party, two
91 supported other parties (not specified) and nine professed non alignment. This sample does
92 not reflect the Australian population at large, and instead may be seen to reflect the kinds of
93 Australians that shop at urban organic markets, and their friendship networks. From a
94 SIT/SCT perspective this is a useful feature of the sample rather than a drawback, because
95 respondents draw upon the same group identities and have similar views of the Australian
96 mainstream as being outside of the groups with which they identify.

97 The lead author analysed all transcripts using NVivo 10. The last author contributed to
98 analysis of the transcripts and the team discussed emerging themes. Participants’ construction
99 of the “Unhealthy Other”, their vaccinating opposite, emerged from the data rather than
100 having been specifically probed. It became a central node, and was further divided into sub-
101 themes, separately coded as topics of interest to the parents’ construction of self.

102 The Flinders University Social and Behavioural Research Ethics Committee provided ethical
103 approval under project number 6976. More detailed accounts of the methods and analysis can
104 be found in earlier publications by members of the team [16, 18, 30].

105 **3. Results**

106 Our results demonstrate how VR parents create and then malign a category of people as their
107 explicit opposites, thereby strengthening their own in-group identities. This category displays
108 the following characteristics: symptoms of poor health; over-consumption of medicine to
109 conform to Western lifestyle expectations; disengagement from nurturing children and self-
110 care; and ignorant, uncritical or fearful conformity.

111 **3.1 ‘They don’t look healthy’**

112 The physical poor health of the people with whom the VR parents compared themselves was
113 noteworthy. Participants described unnamed vaccinated families that would regularly be
114 burdened by illness, whereas their own families were not.

115 Even just like earaches, small, common ailments. Like the difference
116 I see between – my kids are at the same age as the kids that they
117 interact with whose parents don’t necessarily follow the same kind of
118 health philosophy as us – their kids are struggling. Like they have
119 problems with their ears, they need grommets and they’re constantly
120 – there’s always somebody who’s got gastro (Roz).

121 Roz, like all our participants, referred to ‘we’ and ‘us’ when talking about lifestyle and
122 parenting practices, as the prelude to then talking about ‘they’ or ‘them’.

123 Evan recalled his daughter, the only unvaccinated baby in her mother’s group, as

124 the only one with her head up, clear eyes, looking round the room
125 with no dribble. All the rest ... all about the same age, couldn't hold
126 their heads up yet. Drooling. Rashes. Eyes wobbling. No strength ...
127 She was definitely way different to those other kids... She was just
128 undamaged – unaffected. I think all those needles get them for a little
129 bit.

130 Parent soften spoke about the perceived superiority of their own child's health. "I know so
131 many people that haven't vaccinated their children and they're healthier than any other
132 children I have ever known," said Katie.

133 Parents did not only apply this characterisation to children of their contemporaries. Roz
134 criticised her parents, whom she thought were trapped in an unhealthy cycle in which their
135 lifestyle and Western medicine kept them ill.

136 It's just been perpetual, like going to the doctor, going to the hospital,
137 having surgeries trying...to fix things. And then I see what they eat,
138 and ... they're eating things that are actually reducing their health.
139 And then they're going back to the doctor and saying 'I need a tablet
140 for this because this isn't fixed.' So then they're just adding to their ill
141 health.

142 For Cally, even doctors appeared unhealthy: "[T]hey don't look healthy ...[E]ven nurses and
143 stuff, they don't ...[I]t concerns me that they don't look healthy."

144 **3.2 'Have something frozen. Stick it in the microwave.'**

145 Participants in this study saw food that was fresh, organic and home-grown as a marker of
146 responsible living, while the rest of society sought commercially-dictated and unhealthy

147 fixes. “[M]y brother and his wife vaccinate their child and take it to McDonalds and do a lot
148 of things with her that I won’t do with my child,” said Charlotte, who was also appalled by
149 Australian celebrity personal trainer Michelle Bridges. “She’s promoting frozen and
150 packaged food as ‘healthy’. ‘Don’t be a freak and grow your own food. Here, have something
151 frozen. Stick it in the microwave.’”

152 Occasionally, the parents represented their own lives as temporally bifurcated between
153 healthy and unhealthy. Steve, recalling his youth, recounted poor food choices leading to dire
154 consequences of ill health and pharmaceuticals:

155 I remember going once [to the GP] when I was about 18 or 20, when I
156 had a – you know, had the reins to myself. I had a really bad sore
157 throat and I knew that there were natural remedies for it but, you
158 know, living the young adult / late teen life, eating the Maccas
159 [McDonalds] and drinking – not alcohol, but just – thickshakes from
160 Maccas [MacDonalds]. And finding out that I’d got this really bad
161 sore throat, and I succumbed to antibiotics. That was my only one
162 time I’ve ever been medicated.

163 Steve also talked about his extended family and complained that their choices made it hard to
164 restrict his own children’s junk food intake. “[W]hen you’ve got other family members and
165 friends, and kids, who like sugary – you know, you get a taste for processed foods and sugary
166 foods.”

167 **3.3 ‘Take a pill, go back to work.’**

168 Like Roz’s parents and Steve during the “Maccas years”, unthinking consumption of Western
169 medicine was also a significant distinction between the VR parents and those against whom

170 they defined themselves. “I know a lot of people who give [baby Panadol] like it’s water,”
171 said Malinda. The unwillingness of many people in contemporary society to stop, rest and
172 allow bodily recovery was part of this. Vanessa described “ads on TV about having Panadol
173 to go out with your friends that night.” She attributed people wanting a quick “fix” for
174 headaches to “the sense of entitlement of society.” In this way, she constructed herself in
175 express opposition to who do not undertake sustained and non-pharmaceutical efforts at
176 illness prevention or symptom management, or allow their bodies to be ill. (For more on the
177 intensive strategies parents employ, see [15, 18].) “When we’re sick,” she continued, “we
178 need to be kept home. We need to be nurtured... We don’t need to go to school; we don’t
179 need to go to work.” Referencing a well-known Australian television advertisement, she
180 declared:

181 We shouldn’t have to “soldier on” with a Codral flu tablet. ... [W]hen
182 we get sick, to me, it’s a sign that our body is saying, “Slow
183 down.”... So they’re telling people, “...[D]on’t stay in bed and rest.
184 Take a pill, go back to work.

185 This resistance to being an industrial “soldier” was echoed by Dianne, who suggested belief
186 in vaccination’s effectiveness was misguided, since poor lifestyles and Western consumerism
187 were making people sick anyway.

188 We think we’re going to be safe because we’re vaccinated, but
189 actually a lot of the people get sick because ... they’re not living a
190 good life. They’re drinking a lot, they’re smoking a lot. You know,
191 they’re overweight, or they’re not looking after themselves, and a lot
192 of people are so in the system that they just –... they want the next
193 boat or they’ve got to get a car which is better than their next door

194 neighbour, or they've got to have a nice house, and they're working
195 so hard trying to create these things that they're neglecting themselves
196 and then neglecting what their bodies need.

197 **3.4 'Why do they have children ... in the first place?'**

198 In the opinion of the participants, those who relied upon vaccination for wellness
199 demonstrated poor values: not sufficiently tending to children at home, or indeed having
200 children for reasons that seemed unfathomable. They attributed this to economic and social
201 structures as well as parental agency. In Vanessa's view, contemporary society was not
202 'family supportive,' with one parent or grandparents able to look after children. "There's very
203 little support for Mums to stay at home with their kids," agreed Charlotte,

204 which drives me crazy, because ultimately, until a child goes to
205 school, they need their mum. They don't want to be in care.... [T]here
206 needs to be more support so that women can stay at home longer, or
207 men, whatever... I mean, why do they have children, do you know
208 what I mean, in the first place?

209 Thus far, we have not reported any 'othering' data from the five parents in this study who
210 were vaccine hesitant rather than vaccine rejecting. This is because the hesitant parents did
211 not engage in a discourse that overtly constructed themselves as different from vaccinators.
212 However, at this point we refer to Alice, who had ultimately vaccinated, to show how she
213 applied a similar punishing logic to herself:

214 [W]e push them to go to childcare. So we don't want them to catch
215 stuff, so we have to get them vaccinated before they go. So part of it
216 is just fitting into the whole way we live... [T]he sole reason I got

217 [son's name] chickenpox vaccinated was because he was in childcare.

218 So maybe it's a personal judgement on myself... if you were a stay at

219 home Mum, in reality, how many kids are your kids going to get

220 exposed to?

221 **3.5 'Maybe you *do* need vaccinations'**

222 Some participants argued that people living less healthy lifestyles from themselves might

223 actually benefit from vaccination, and this construction shows, as we have reported

224 elsewhere, how they saw their unvaccinated children as distinct from children unvaccinated

225 due to disadvantage [18]. "I understand the government wanting people to vaccinate," said

226 Dianne. "Especially the families who are just not vaccinating because they can't be bothered,

227 or the parents are so out of it that they don't have that care for their children to even think

228 about health." Steve concurred: "If you don't want to address that side, well, maybe you *do*

229 need vaccinations, because your body... doesn't get the right nutrients it needs." Other

230 parents, however, saw vaccination as toxic for everybody.

231 **3.6 'The masses kinda stay together'**

232 Participants presented the complicity of vaccinating parents in their own or their children's

233 poor health in a variety of ways, some of which ascribed agency to these parents, and others

234 which contextualised their choices as arising from ignorance or fear.

235 Ill-informed ignorance was a significant trope. Sometimes this was discussed in sympathetic

236 terms. Charlotte worried about "a vulnerable mother who hasn't heard the other side of

237 vaccinations or hasn't heard that breast milk is better than putting them on the bottle..."

238 Natalie was concerned about saying things that would upset vaccinators, since they had made

239 a decision "that they could now do nothing about. They've already given it to their kids..."

240 The parents had less tolerance for what they framed as *wilful* ignorance. “No one’s really
241 interested in hearing the other side,” suggested Natalie. “What I’ve found is people don’t
242 want to know the truth,” said Evan. “A lot of the people who are pro-vaccination, I find that
243 ... they haven’t done much research,” said Daisy. “They just think it’s wrong that I’m doing
244 what I’m doing.” Anna, by way of a wide-ranging discussion including US politics, said, “I
245 just think the majority don’t think.” Vanessa believed, “The public are listening to the front
246 page of the paper.”

247 Several participants used the language of ‘sheep.’

248 [M]ost people don’t have a choice because they don’t *realise* there’s a
249 choice. They just go with it like sheep. (Steve).

250 [M]ost people are asleep on the planet. We’re literally like sheep ...
251 we’ve got to start fucking getting educated ... I just had the vision of
252 people – most people – just feeding out of troughs... (Owen)

253 Cally thought that her mother exercised poor reasoning in remaining part of the pro-
254 vaccinating mainstream.

255 My mum won’t research it because she knew someone who had polio.
256 One person who had polio and had the callipers on. And I said,
257 “Yeah, but how long were the callipers on for?” “Oh, I can’t
258 remember, I was a kid.” So she had one incident, and she has based
259 her whole decision on that.

260 Cally’s mother was afraid of disease, and this was, for her, a reason to vaccinate. However,
261 Cally and other participants thought that such fear produced *wilful* ignorance. They
262 represented vaccinators as so fearful in general that they were afraid to face the truth about

263 vaccines. “The people I know that do vaccinate, it’s very clear from their language that it’s
264 all about fear,” said Natalie. Evan told this story of fear through fluoridation of water, which
265 he also considered to be making people compliant.

266 It’s actually toxic waste, and we are actually using this waste in our
267 waters. ... It’s not in there for our teeth. It’s in there to make us
268 submissive, and to get rid of the toxic waste that they didn’t know
269 what to do with ... They know that it’s toxic ... but people still refuse
270 to actually look at that kind of information and take it on ... because
271 the masses kinda stay together, and I think that’s what this
272 vaccination thing is about. They are scared.

273 **4. Discussion**

274 Analysing the above, we identify a two-stage process occurring for participants’
275 differentiation from the vaccinating mainstream. The first stage involves representing
276 differences that are significant markers, but do not translate into active inter-group dynamics.
277 The second stage mobilises the latter. Through both stages, vaccine rejecting parents
278 construct an Unhealthy Other against which they emerge as superior in terms of health,
279 lifestyle and decision-making.

280 One significant marker of differentiation is that the overall health practices of the vaccinating
281 mainstream are categorically inferior to the participants’ own, making children of the
282 vaccinating group recognisable by their visibly poorer health. Because the vaccinating
283 mainstream is the large majority of people, this involves respondents pathologizing the
284 “normal” in childhood health and development. Roz describes “common ailments” as the
285 problem of kids who are “struggling” because their parents “don’t necessarily follow the
286 same kind of health philosophy as us.” Evan’s account of babies as “Drooling. Rashes. Eyes

287 wobbling. No strength” may sound like a description of normal infants, but he attributes these
288 characteristics to “the needles” that “get them for a little bit,” in contrast to his own
289 unvaccinated daughter who was “the only one with her head up, clear eyes, looking around
290 the room with no dribble.”

291 This sense of group superiority extends beyond childhood health to lifestyle more generally
292 [18]. Roz’s description of her own parents depicts people reliant on doctors and the medical
293 establishment because of their unhealthy lifestyles. Dianne similarly identifies the cause of
294 sickness as “not living a good life,” suggesting that for this reason, most vaccinators will get
295 sick anyway. Poor diet, consumerism, and lack of work-life balance are all interconnected
296 pathologies in this view. They result in the mainstream not recognising or valuing what is
297 important, including that mothers – or perhaps fathers – should be providing high-input care
298 for their children. (Alice, the sole vaccinator in the sample to reproduce this discourse,
299 ultimately judges herself lacking by its logic.)

300 The distinction drawn between thought and non-thought is also noteworthy, with its two
301 possible framings of the vaccinating mainstream. More generous framings attribute a lack of
302 thought and awareness to those who vaccinate, whereas more judgemental framings invoke a
303 paralysing fear: the ‘see-no-evil’ monkey placing his hands over his eyes rather than facing
304 the truth about vaccines. Hobson-West found that “vaccine critical” organisations sometimes
305 framed laziness (non-investigation of vaccines) in a sympathetic way, but ultimately such
306 invocations appeared to work for the “rhetorical purpose” of ‘negatively contrast[ing] the
307 usual passive acceptance of vaccination with the minority of parents who are free thinkers.’
308 (The term ‘sheep’ was used here too.) She notes that such framing precludes the idea that one
309 could decide to vaccinate after engaging in a reasoned decision-making process. [9] As with
310 our participants, vaccination instead became the province of the pitifully or wilfully ignorant.

311 The second stage of the identification process sees parents describing and participating in
312 active inter-group dynamics. Here, the vaccinating mainstream is not merely a separate
313 category of person, but one that is problematic for the participants' well-being and social
314 identity, grating against and hence further defining it.

315 One locus for this is culture wars around health. Charlotte takes umbrage at the marketing of
316 frozen dinners as 'healthy,' linking this to what she perceives as a negative framing of people
317 who are *actually* healthy in growing their own food. The mainstream is appropriating natural
318 health (a key virtue-signal for salutogenic parents), distorting and defiling it, selling it back to
319 them as a packaged commodity, and insulting them to boot ('freak'). Such a poorly behaving
320 mainstream pushes out the participants further and solidifies their oppositional identity.

321 Another locus of inter-group dynamics lies in the Unhealthy Other tempting and
322 contaminating those who are attempting to live salutogenically. Steve struggles to limit his
323 children's sugar intake while the extended family lives otherwise. Here, then, the Unhealthy
324 Other is a blockage to the purity and virtue of those whose identity is centred upon living
325 well.

326 Finally, participants depict representatives of the vaccinating mainstream as judgemental
327 instigators of social conflict, and unjustifiably so, since they follow poor epistemic practices
328 (processes of reasoning). Daisy's opponents in arguments "don't know why she's wrong, just
329 that she is." Cally's mother draws upon a sample of one polio victim. Vaccinators do indeed
330 commit several of the same epistemic vices as non-vaccinators, providing succour to these
331 representations [27]. Our VR parents see the Unhealthy Other's weaknesses and assign them
332 causality for behaviour that divides and differentiates the groups.

333 These powerful representations of the Unhealthy Other, and their mobilisation towards inter-
334 group distinction and conflict, should provide health professionals and policymakers pause

335 for thought. Whilst we cannot address all markers and mobilisations here, we have one key
336 take-home message. Framed convincingly by these parents, Western medicine too often
337 presents health as a means – witness Roz’s parents eating their way through pills to mitigate
338 against poor diet, or the entire industry of pep-me-ups, from painkillers to stimulants
339 providing *functional* health so that people can stay working, consuming and plugged into “the
340 system” (Dianne). *Holistic* health is qualitatively different; not a means but an end. As long
341 as vaccinations are framed instrumentally, as an enabler of (toxic) modern life, they act as a
342 marker for what *not to be* for the parents in this study, even as the rest of the population
343 accepts functional health aids as acceptable or necessary.

344 When it comes to engaging with vaccine hesitant parents, then, the more that vaccination can
345 be relocated from the medical establishment, the less likely they are to see it as an instrument
346 of a hostile and imposing outgroup. Additional research (by us and others) that provides keys
347 to in-group construction (rather than focusing on out group denunciation, as we do here)
348 could provide some answers. We know that the parents in this study – and vaccine refusing
349 and hesitant parents internationally – tend to engage with CAM professionals and seek out
350 low-intervention or ‘alternative’ childbirth (which would involve midwifery care) [10, 13, 15,
351 27, 31]. Accordingly, attention could be given to training such a cohort of vaccination
352 providers who identify with – and are identified as – the holistic health in-group, but are
353 nonetheless committed to vaccination. This is not as outlandish as it may sound. In parts of
354 Australia, Indigenous health workers (not nurses or doctors) are trained and certified to
355 administer vaccines, on the basis that they have reach and trust in communities that the
356 existing medical establishment is poor at accessing. Midwives in public hospital settings
357 already deliver maternal and infant vaccines. Midwives in private practice and chiropractors
358 – many of the latter do support vaccination [32] – could be awarded eligibility and training to
359 vaccinate, and access incentive payments currently available to GPs. Whilst many providers

360 would not take up the opportunity, extending vaccination into non-traditional settings could
361 help remove vaccination and non-vaccination as markers of out-group and in-group identity.

362 **4.1 Strengths and limitations**

363 An interdisciplinary authorship team spanning political science, sociology and vaccine social
364 science facilitated our use of social identity theory to ‘turn the mirror’ to the vaccinating
365 mainstream. Numerous team discussions enhanced the validity of the results. The sample
366 size, though standard to qualitative research, is a limitation to generalisability. The
367 construction of the Unhealthy Other was not probed, but rather emerged through the
368 interview process. Further details of its construction could be explicitly probed in future
369 studies.

370 **5. Conclusion**

371 This study increases our understanding of the social dimensions of non-vaccination. In
372 conformity with the expectations of SIT and SCT, non-vaccinating parents see themselves as
373 part of a healthy group. This is accentuated by the unhealthiness of the vaccinating
374 mainstream, which they discussed at length in interviews. We suggest mitigating the
375 ‘groupness’ of vaccination and non-vaccination by extending the practice of vaccination to
376 recognisable practitioners of holistic health.

377 **Contributions**

378 The last author led the study. Additional study contributors who were not authors are
379 acknowledged below. The lead author led the data analysis with input from the last author.
380 The lead author and DS led the writing of the manuscript, which was approved by all authors.

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