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3 **Risk Perceptions of Environmental Hazards and Human Reproduction: A Community**

4 **Based Survey**

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24 **Abstract**

25 Objectives: We have investigated the Australian public's perceived risks on human reproductive

26 health from a number of identified environmental hazards.

27 Methods: A sample of 1261 subjects were interviewed. This interview included specific

28 questions related to perceived risks of certain environmental hazards to human reproductive

29 health.

30 Results: Women were almost twice as likely to rank all hazards as harmful or very harmful to

31 human reproduction than men. Age also influenced perceived risk with those in the 35 and older

32 age groups more likely to rank lead as a harmful hazard when compared with the 18-34 group.

33 Pesticides were identified by 84.5% of the sample as the most harmful environmental hazard to

34 human reproduction.

35 Conclusions: Similar to other environmental hazards, different groups of people in the general

36 population perceive hazards relating to reproductive health differently. This information is

37 important for both policy makers and health professionals dealing with reproductive

38 environmental health issues.

39

Introduction

Environmental health is an area of growing concern due to major global environmental changes and an increase in established links between a number of diseases and environmental exposures. Children and the developing fetus are known to be particularly vulnerable to the impact of environmental pollution [1] and as such, the European Environment Agency (EEA) [2] and the World Health Organisation (WHO) [3] have highlighted this as a high priority which warrants further research.

Established risks for the fetus that relate to life circumstances and so-called lifestyle factors include smoking and second hand smoke, alcohol and other licit and non-licit drugs, and physical exercise linked to factors such as obesity [4, 5]. These might be viewed as 'social environmental risk factors' where data are often extensive and research has been conducted in some instances for decades. Greater uncertainty and doubt exist about what could be described as non-personal environmental risk factors and their impacts generated not by choices but by activities external to and usually beyond the control of individuals. These are the focus for our paper. They may also often involve complex inter-actions and long term, low level exposures and reviews flag both the established risks and new potential hazards during pregnancy that may involve a range of environmental factors.

The effects of exposure to environmental toxins especially for pregnant women were propelled into the public domain in the 1960s with events such as the poisoning of Minamata Bay by mercury dumped by a plastics company [6]. Infants born to mothers who had consumed

62 contaminated fish from the bay developed a number of problems including cerebral palsy,

63 developmental delays, central nervous system damage and blindness.

64

65 Environmental health hazards affecting human health are most commonly classified as chemical,

66 biological, physical, mechanical and psychological. These can be naturally occurring hazards (for

67 example radon in drinking water) or constructed (for example pesticides on food) [7]. Although

68 exposure to chemicals at critical periods of susceptibility in utero may result in lifelong adverse

69 health effects, the effects of many of these environmental toxins to the developing fetus are

70 unknown [7]. Pregnant women are exposed to environmental factors such as air pollution,

71 pesticides, domestic and commercial chemicals and radiation through their place of work, their

72 home or their local environment. In 2005 a number of reports relating to exposure of babies to

73 contaminants through cord blood provoked further interest in the link between environmental

74 exposure and child health [8, 9]. A recent survey in the United States concluded that virtually all

75 pregnant women carry multiple chemicals within their bodies. Interestingly, some of these

76 detected chemicals have been banned since the early 1970s and others are used commonly in

77 personal care products or non-stick cookware [10].

78

79 A number of systematic reviews (literature reviews using systematic, transparent and reproducible

80 methods) have examined the evidence on the associations between prenatal exposure to

81 environment hazards and adverse effects on children (see Table 1). There is evidence that

82 parental exposure to pesticides is associated with cancer in children [11-13] particularly

83 childhood leukaemia [12, 13]. Exposure to pesticides is also linked to several other cancers, birth

84 defects, fetal death and altered growth [9, 14]. Exposure to polychlorinated biphenyls (PCBs)

85   can have a subtle effect on childrens neurodevelopment [15] and lead and PCBs can affect brain

86   development, behaviour and reproduction at very low levels [16]. There is also evidence to

87   suggest a causal relationship between air pollution and fetal growth but the association is small

88   and it is difficult to determine which particulates are most harmful [17-20]. However, there is

89   equivocal or conflicting evidence on the associations between effects on the fetus and diagnostic

90   x-rays [21], non-ionizing radiation [22], low level radio-frequency [23], exposure to hair products

91   [24], and nitrates in drinking water [25].

92

93   The public perceptions and attitudes towards risk and risk reduction are central to the 'new'

94   public health [26]. There is an increasing emphasis on both public health and health promotion

95   bodies to avert risks of disease, particularly in high risk populations or where large populations

96   may be exposed. Risk discourse in public health can be separated into various perspectives

97   including: risk to health as a result of individual lifestyle choices and environmental hazards such

98   as pollution and toxic chemicals [27]. Ulrich Beck first used the term 'risk society' in the 1990's

99   [28] and he viewed risk as a product of late modernity, whereby human progress and human

100   development have produced more and more hazards which threaten the ecosystem and human

101   health. His statements about risk mainly focus on external hazards and dangers (e.g. pollution

102   and global warming). For Beck, modern society changed fundamentally from a society

103   characterised primarily by social inequalities (such as income) to a society where (although such

104   inequalities remain), the chief threats are environmental hazards which cut across traditional

105   inequalities. He specifically identified the different responses of the scientific community and

106   the public to risk and observed: 'scientific rationality without social rationality is empty: social

107   reality without scientific rationality is blind'. He further noted that: 'Social movements raise

108   questions that are not answered by the risk technicians at all, and the technicians answer

109   questions which miss out what was really asked and what feeds public anxiety' [28].

110

111   Whilst it is commonly accepted that dangers and hazards do exist, they are not necessarily

112   viewed equally by the public. However the public's concerns about risks cannot necessarily be

113   attributed to ignorance or irrationality. It has been maintained that risk has generally been

114   discussed through a 'paradigm of rational choice' and to consider risk assessment independent of

115   culture is useless [29]. Research has also shown that much of the public's reactions to risk can

116   be attributed to how they respond to hazards in terms of technical, social and perceptional

117   elements that are not normally well addressed in risk assessments [30].

118

119   There is relatively little research on the general public's perceptions of specific environmental

120   factors related to reproductive health [31, 32]. These reviews and recent guides in the USA [33,

121   34] concur that this is an area of considerable significance to public health although it is under

122   researched. Australia is a country of special interest because in some areas it has progressive

123   laws in the field in question, it contains a wide range of potentially interesting reproductive

124   environmental hazards, and it has a number of national surveys that explore environmental

125   attitudes. Queensland contains agricultural, mining, industrial activities and a range of urban and

126   rural settings. The state has also some progressive social legislation.

127

128   The aim of this study was to explore aspects of the public's perceived risks of environmental

129   hazards on human reproduction by (i) gender, (ii) place of residence (city, town or rural) (iii) age

130   and (iv) presence of children in the household. The specific environmental hazards considered in

131   this study were selected due to the previous work we have conducted in this area and from the

132   literature reviewed. These are also the hazards that are believed to be most familiar to the public.

133

Materials and Methods

134 **Materials and Methods**

135 The study employed survey methods of a randomly selected sample of people living in Australia.

136 The study received ethical approval from the University Human Research Ethics Committee.

137 Data were collected in July and August 2010 as part of the annual Queensland Social Survey

138 conducted by the population Research Laboratory at Central Queensland University. Sampling

139 was a two-stage selection process involving i) Selection of households; and ii) Selection of

140 respondent within each household. The target population designated for telephone interviewing

141 was all persons 18 years of age or older who, at the time of the survey, were living in a home in

142 Queensland that could be contacted by direct-dialling to a land based telephone service. A

143 random selection approach was used to ensure that all respondents had an equal chance to be

144 contacted. The sampling error is a measure of the validity of the descriptive statistics that are

145 observed in a sample. Survey estimates of sampling error for the total sample of 1261 indicate

146 that this is accurate within plus or minus 2.7 percentage points, at a 95% confidence interval

147 [35].

148

149 The sample was drawn using list-assisted random digit dialling. All duplicate and mobile

150 telephone numbers were removed from the generated lists. A respondent within each household

151 was pre-selected on the basis of gender to ensure an equal yet random selection of male and

152 female participants. Within the household, one eligible person was selected as the respondent for

153 the 30 minute interview. A respondent within each household was selected on the basis of

154 gender using the following selection guidelines to ensure an equal yet random selection of male

155 and female participants i) the dwelling unit must be the person's usual place of residence and

156 he/she must be 18 years of age or older; ii) each household was randomly pre-selected as either a

157 male or female household iii) if there was more than one male/female in the household then the

158 male/female that had the most recent birthday was selected iv) If there was no-one of the pre-

159 selected gender residing in the house then the house was designated not qualified. Past surveys

160 have indicated that 60% of the time, the first household contact is female. Previous experience

161 indicated that recruitment to the survey was more successful when calls were made in the

162 evenings or weekends.

163

164 The questionnaire was pilot tested by trained interviewers on a total of 52 respondents.

165 Interviewer comments (e.g. any confusing questions, inadequate response categories etc) and

166 pre-test response distributions were made available to the researchers. Following this pilot, one

167 of our questions response categories was modified for the main data collection.

168

169 The Queensland Social Survey is an annual omnibus survey that addresses a variety of topics of

170 interest to the research community. The survey consists of a standardised introduction, a series

171 of question sets reflecting the specific research interests of the university and community

172 researchers participating in the study, and demographic questions. Questions relating to the

173 public's opinion of environmental hazards and human reproduction were embedded into the

174 survey. Interviewees were asked to firstly rank five individual environmental hazards from

175 'very harmful' to not 'harmful at all' to human reproduction and secondly to choose from a list

176 of five hazards which they perceived to be the hazard most harmful to human reproduction.

177 Selection of the questions on common reproductive hazards in the survey were geared to

178 covering some of the most common hazards linked to reproduction and likely to occur in the

179 state and based on the knowledge of the authors of those substances or activities linked to

180   environmental exposure in major international and national governmental and scientific guides

181   [32].

182

183   All data were cleaned, coded and analysed using PASW Statistics Version 18. The data cleaning

184   process included wildcode, discrepant value, and consistency checks. Simple frequencies were

185   calculated for each question and expressed as percentages. Frequencies were presented by total

186   sample, gender, age group, place of residence, and presence of children in the household. The

187   resultant data set contains 1261 cases.

188

189   For questions where respondents were asked as to whether they considered a list of potential

190   environmental hazards to be very harmful, harmful, neutral, slightly harmful or not harmful at all

191   to reproduction, numbers and percentages of those considering them to be harmful or very

192   harmful were determined and stratified by gender, age group, place of residence, and presence of

193   children in the household. A logistic regression was then carried out with whether or not the

194   pollutant was considered to be harmful or very harmful as the dependent variable. Odds ratios

195   were determined for each covariate, adjusted for all other covariates.

196

197 **Results**

198 There were 1261 telephone interviews completed and the characteristics of the respondents are

199 presented in Table 2. Comparison of the survey sample with the most recent Australian Bureau

200 of Statistics (ABS) census data (2006) revealed there was over sampling in the 45-65+ age

201 categories and under sampling in the under 45 age categories. The response rate was calculated

202 by dividing the number of people participating in the survey (completed or partially completed

203 interview) by the number of people in the selected survey. For this survey the response rate was

204 35.2%.

205

206 In the total sample of Queensland residents there was general agreement that pesticides,

207 household chemicals and animal borne diseases had either a very harmful or harmful effect on

208 human reproduction (Table 2). Pesticides were described by the highest proportion (84.5%) of

209 the sample as harmful or very harmful. This agreement ranged from a low of 70.5% in the 18-34

210 year-old age group to a high of 88% in the 45-54 year-old age group. With only 26.3% of the

211 sample ranking cosmetics and hair colours as harmful or very harmful, this hazard was perceived

212 to cause the lowest risk to reproduction.

213

214 Table 3 represents the result of a logistic regression analyses for each potential hazard. Results

215 indicate that there was a significant association between gender and perceived risk. In general,

216 women were around twice as likely to rank all hazards as harmful or very harmful than men.

217 Those in the 35-44, 45-54, 55-64 and 65 years and older age groups were also all significantly

218 more likely to rank pesticides as harmful or very harmful than those in the 18-34 age group;

219   while those in the 45-54 age group were significantly more likely to rank household

220   chemicals/paints and radiation as harmful or very harmful than the 18-34 age group.

221

222   Lead was identified by 48.5% of respondents to be the most harmful hazard to reproduction

223   when compared with stress (32.4%), carrying and lifting (2.1%), water pollution (5.7%) and air

224   pollution (6.3%) (Table 4). A Chi-squared test for independence indicated no significant

225   association between most harmful hazard identified with either gender, place of residence or

226   children in the household (p>0.05). A significant association was, however, noted with age

227   (p<0.001). Only 32.5% of those in the younger age group (18-34 years) identified lead as the

228   most harmful hazard compared with 45.9% in the 35-44 group, 52.9% in the 45-54 group, 54.4%

229   in the 55-64 group and 49.2% in the 65 years and older group. Stress however, was chosen as

230   the most harmful hazard in the younger age group with this agreement decreasing as age

231   increased.

232

233

234 **Discussion**

235 This study provides a snapshot of risk perceptions. Whilst the scientific evidence of the effects

236 of prenatal exposure to environment hazards and adverse effects on children is on the rise, it is

237 important to investigate what the public believe about the exposure to a range of hazards and

238 reproductive health. To date, little empirical data about the public's knowledge about

239 environmental hazards and reproduction have been reported. Data such as that collected in this

240 study has been compared with the scientific evidence base, whether that provides strong, weak,

241 or absent links to adverse effects to human health. Comparisons such as these may provide an

242 invaluable contribution to both environmental health policy and practice developments.

243

244 Setting the results either in the context of Australia as a whole, or globally, is difficult because of

245 the lack of comparative studies using similar methodologies. However, the Australian-wide

246 survey of public environmental health perceptions - not specifically environmental risk to human

247 reproduction - based on 2,008 interviews and carried out in 2000 did identify some similar but

248 broad brush conclusions to our study, both on gender responses and several hazards. It

249 commented that concerns about risks that affected children and pregnant women are usually

250 heightened and noted: "Pollution issues all frequently rated as high risks, with chemical pollution

251 overall being regarded as the greatest risk. Chemicals such as pesticides and insecticides were

252 considered high risk by about half of respondents. Dioxin chemicals ranked lower however,

253 perhaps indicating a lack of recognition of this class of chemicals. New or topical issues such as

254 food irradiation and genetically modified food did not rank as high a risk as most of the other

255 categories" [36] pg 31.

256

257 A pioneering study which is still relevant to the present analysis of global risks to health

258 concluded that the most highly uncertain risks such as pesticides and nuclear power are deemed

259 the most dreaded, while risks associated with health interventions and clinical procedures are

260 more acceptable [37]. A range of factors have been shown to influence risk perceptions and

261 these are embedded within different economic, social and cultural environments [38]. Some of

262 these have been explored in the survey such as gender, age and location. Others like

263 employment, family and peer group, and education may also be factors. The media too plays a

264 part in risk perception and rating - the web as well as radio, TV and newspapers are of growing

265 significance although evidence-based media sources may not always be accessed.

266

267 We conducted a search, using environmental health, reproduction and specific hazard topics of

268 all national Australian and major Western Australian newspapers through the Nexis-Lexis

269 newspaper data base for the three months prior to the survey date. We also accessed the web

270 sites of major Australian TV channels for the same period using the same search terms.

271 Surprisingly, no major stories on general environmental hazards linked to reproductive outcomes

272 were identified. Major TV channels such as ABC had only one story on the topic in the six

273 months prior to the survey. In the early 2000s there had been several major news stories linked

274 to pesticides and reproduction, other more general stories on environmental hazards not

275 specifically related to reproduction, such as female breast cancer clusters in TV offices, that may

276 have shaped some public responses to hazard ratings. These sources have often diverse and

277 complex influences that merit further investigation but are beyond the scope of the current

278 survey.

279 Where different generations had some extensive sensitisation to or greater knowledge of hazards

280 than later generations, risk ratings, whatever the evidence base indicates, may be lower or may

281 be higher for a range of reasons. Hazards widely publicised over several decades such as

282 pesticides in general and specific pesticides in particular appear to score highly. However, older

283 hazards that are considered to be no longer present at levels or in places that might threaten

284 health may sometimes be given lower risk ratings. The risk rating may be further lowered if up

285 to date scientific evidence is not available or not highlighted in the population at large. Lead is a

286 case in point in Table 4 [39]. City dwellers were more likely to rate lead as the most harmful

287 hazard to human reproduction when compared with town dwellers (50.6% v's 43.6%). This may

288 again reflect particular concerns about lead paint in old buildings and in pipes with related

289 information campaigns and public health interventions to remove the hazard in large

290 conurbations.

291

292 The chronic high level exposures to lead have been well known and well publicised as have the

293 effects of high exposures on female reproduction whilst the male reproductive health hazards of

294 lead have been downplayed or ignored. However, recent research has focused on effects that are

295 chronic, low level and sometimes subtle including reproductive effects. The neurological and

296 behavioural as well as the reproductive effects of very low lead levels in humans has yet to

297 percolate through into the public domain. This raises a raft of questions about information,

298 communication, regulation and enforcement on environmental hazards.

299

300 Familiarity that is sometimes a reflection of knowledge and sometimes of ignorance may also

301 explain some low ratings and lack of knowledge of a hazard may explain high risk ratings. For

302 example, in Table 2 similar rankings surprisingly exist from residents in cities and towns for

303 animal-borne diseases to that of residents in rural areas. This may be because those working with

304 animals in agricultural areas come across zoonotic diseases frequently and rate the risks highly

305 whereas those in towns and cities hear about a few dangerous zoonotic diseases and may over-

306 estimate their threats. Alternatively, dog and cat borne diseases may be brought to the attention

307 of owners by vets and are more widely publicized than other hazards in urban areas particularly

308 in terms of toxocaria canis and toxoplasmosis. There is some evidence too that vets and

309 physicians assess and identify zoonotic threats differently: vets may downplay tick-borne

310 diseases as they are not involved in human diagnoses and physicians may misunderstand the

311 threats of toxoplasmosis from sheep [40]. With such confusion among health professionals, it is

312 unsurprising that there may be confusion in the minds of the public about what are real threats

313 and what the scale of those threats is.

314

315 The responses for animal-borne diseases again show a greater risk perception for women than

316 men although a zoonotic-specific set of questions might have elicited different responses. Hence

317 there is much information publicly available about reproductive adverse effects in women from

318 zoonotic diseases that men and women would be aware of. Risks of contracting Q disease are

319 probably more limited to those in abattoirs and animal husbandry. The age profiles on risk

320 perceptions, however, are harder to interpret with age group 45-54 ranking risks higher and the

321 18-34 group ranking risks lowest. This may reflect the knowledge and experience base of

322 responders.

323

324 There is a growing body of evidence to indicate that women express far greater concern than

325 men with regard to health and environmental hazards [41]. Explanations for this difference have

326 focused on both social and biological factors. It has been suggested by some that there is an

327 association between knowledge of the potential hazard and the perceived risk [41]. However, in

328 a study of male and female scientists of similar scientific training [42], the authors concluded

329 that male scientists tended to see substantially less risk from nuclear technologies and materials

330 than female scientists. A review of 85 published studies in this area [43] reported that for 38

331 studies that examined nuclear power and radio-active waste, women expressed greater concern in

332 every study; for the 19 studies that examined risk-related environmental issues such as toxic

333 chemical waste, women expressed greater concern in 95% of these.

334

335 Men ranked stress, air pollution and lifting and carrying as greater hazards to reproduction than

336 women (Table 4). Why this should be so is not clear. Air pollution and lifting and carrying have

337 not been linked to adverse male reproductive effects and it may be that women adjust to

338 everyday hazards that they face and 'downplay' them. With much recent information and media

339 discussion of stress, it is perhaps easier to explain why younger age groups rank stress highest

340 and older age groups place it lowest although different definitions of stress may be used by

341 different age groups. Findings for which no explanation exist or where sample size may be a

342 factor occur on water pollution which attracts the highest hazard rating for younger age groups

343 but the lowest for the 35-44 group.

344

345 Although insightful, the current study was subject to a number of limitations. Participants were

346 volunteers and therefore there may be some selection bias. However, it is worth noting that

347 respondents were answering questions on a number of health related topics and are unlikely to

348 have agreed to participate because they feel strongly about the topic area being studied here.

349 Also, only Queensland residents that were contactable by a landline telephone were able to

350 participate. It should be acknowledged that the sample is not representative of the Australian

351 population with over representation of the 45 years and older age group and under representation

352 of the 45 years and younger group. Gaining adequate participation of younger respondents when

353 conducting computer –assisted telephone interviewing surveys using only randomly generated

354 landline telephone samples has become more difficult as increasing numbers of young people

355 use only mobile telephones. Recent studies have shown that exclusion of mobile phone only

356 households does not significantly influence survey results [44]. The response rate of 35.2% is

357 representitive of general household surveys which have been on the decline in recent years [45].

358 It has been suggested that with reduced telephone number listings and people's increasing

359 resistance to unwanted phone calls, alternatives to telephone surveys, such as computer and

360 internet-based approaches, should be investigated [46]. Strengths of this study include the use of

361 a large state-wide sample to conduct an analysis of perceived risks of environmental health on

362 human reproduction. No similar survey of this topic and of this scale has been reported in the

363 scientific literature.

364

368

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370   18

371 **Conflict of Interest**

372 The authors declare that they have no conflict of interest.

373

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505 Table 1. Summary of review level evidence on associations between exposure and outcomes in
506 pregnancy

Potential hazard	Outcome investigated	Evidence base	Association between exposure & outcome*
Pesticides	Childhood cancer	Systematic review[1][11]	+
Pesticides	Reproductive effects: birth defects, fetal death, altered growth, and other outcomes.	Systematic review[14]	+
Residual pesticides, insecticides and herbicides	Childhood leukaemia	Systematic review[12]	+
Pesticides (parental exposure to)	Childhood leukaemia	Systematic review[13]	+
Air pollution	Fetal growth	Systematic review[18]	+
Air pollution	Fetal growth Respiratory deaths	Systematic review[17]	±
Air pollution	Fetal growth Duration of pregnancy	Systematic review[19]	±
Air pollution	Fetal growth and duration of pregnancy	Systematic review[20]	±
Polychlorinated biphenyls (PCBs)	Child neurodevelopment	Systematic review[15]	+
Electromagnetic fields (non-ionizing radiation)	Childhood leukaemia	Systematic review[22]	±
Low level radio-frequency	Birth defects, fertility, neuroblastoma in offspring, & reproductive hormones	Literature review[23]	±
Parental smoking	Childhood cancer	Systematic review[47]	+
Working in floriculture (exposed to, physical activity, temperatures & pesticides)	Spontaneous abortion and birth defects	Meta-analysis of two studies[48]	+
Nitrates in drinking water	Spontaneous abortions, intrauterine growth restriction,	Literature review[25]	±

Potential hazard	Outcome investigated	Evidence base	Association between exposure & outcome*
	and various birth defects		
Agent Orange (dioxin)	Birth defects	Systematic review[49]	+
Working in hairdressers – exposure to hair products	Fertility and pregnancy complications Birth malformations particularly orofacial cleft	Systematic review[24]	±
Diagnostic x-rays	Childhood cancer	Systematic review[50]	±
Tritium	Various	Systematic review[51]	±
Environmental oestrogens	Male reproductive health	Systematic review[52]	±
Lead, polychlorinated biphenyls, mercury, cocaine, alcohol, marijuana, cigarettes and antidepressants.	Mental health in children and adolescents	Systematic review[16]	+ for some exposure ± for others

507 [1] A systematic review uses systematic, reproducible and transparent methods to identify, appraise and synthesise
508 studies
509 * + association between exposure to hazard and outcome

510 ± conflicting or not enough evidence of an association between exposure to hazard and outcome

511 - No association between exposure to hazard and outcome

512

513   Table 2: Percentages of sample who ranked each hazard as harmful or very harmful to human

514   reproduction

	Sample	Pesticides	Household chemicals & paints	Radiation (e.g. pylons, microwaves, phone masts)	Cosmetics and hair colours	Animal borne diseases
	%	%	%	%	%	%
Total Sample (n=1261)	-	84.5	68.8	53.4	26.3	62.5
Gender (n=1261)						
Male	50.4	80.0	60.0	48.2	28.8	53.4
Female	49.6	89.1	77.8	58.6	31.9	71.7
Age Group (n=1251)						
18-34	13.2	70.5	60.2	45.8	20.5	63.3
35-44	17.3	87.6	73.4	54.1	26.6	62.4
45-54	23.1	88.0	71.1	57.0	27.1	65.3
55-64	22.4	87.6	72.4	57.6	30.4	64.3
65+	24.0	83.8	64.7	49.5	24.8	57.8
Place of Residence (n=1257)						
City	52.0	84.1	68.4	51.2	25.2	62.5
Town	25.5	84.1	68.8	53.3	27.7	63.2
Rural	22.2	86.1	69.6	58.6	27.9	62.1
Children in the household (n=1258)						
No	64.6	83.4	68.2	53.8	27.3	62.2
Yes	35.2	86.7	70.3	52.7	24.5	63.3

Note: No response given to age n=10 (0.8%), place or residence n=4 (0.3%) and children in the household n=3 (0.2%)

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517 Table 3: Adjusted odds ratios and 95% confidence intervals for associations between socio-demographic

518 variables and whether respondents considered hazards to be harmful or very harmful to reproduction

	Sample	Pesticides	Household chemicals & paints	Radiation (e.g. pylons, microwaves, phone masts)	Cosmetics and hair colours	Animal borne diseases
	%	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Gender (n=1261)						
Male	50.4	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref
Female	49.6	2.04 (1.48-2.83)*	2.32 (1.81-2.98)*	1.52 (1.22-1.90)*	1.78 (1.38-2.30)*	2.25 (1.78-2.85)*
Age Group (n=1251)						
18-34	13.2	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref
35-44	17.3	2.44 (1.41-4.21)*	1.67 (1.06-2.61)*	1.36 (0.89-2.07)	1.40 (0.85-2.30)	0.88 (0.57-1.37)
45-54	23.1	3.27 (1.98-5.41)*	1.65 (1.09-2.49)*	1.53 (1.04-2.27)*	1.41 (0.88-2.25)	1.07 (0.71-1.61)
55-64	22.4	3.71 (2.19-6.31)*	1.79 (1.15-2.78)	1.54 (1.01-2.33)*	1.59 (0.97-2.59)	1.01 (0.66-1.56)
65+	24.0	2.80 (1.69-4.64)*	1.25 (0.81-1.93)	1.11 (0.73-1.68)	1.19 (0.72-1.96)	0.77 (0.50-1.18)
Place of Residence (n=1257)						
City	52.0	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref
Town	25.5	1.06 (0.72-1.54)	1.01 (0.75-1.36)	1.09 (0.83-1.43)	1.15 (0.85-1.56)	0.98 (0.74-1.30)
Rural	22.2	1.11 (0.74-1.68)	1.06 (0.77-1.44)	1.34 (1.01-1.78)*	1.15 (0.84-1.58)	0.99 (0.74 −1.33)
Children in the household (n=1258)						
No	64.6	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref	1.00 Ref
Yes	35.2	1.71 (1.13-2.59)*	1.11 (0.81-1.54)	0.96 (0.71-1.29)	0.89 (0.63-1.26)	1.02 (0.75-1.40)

Note: each odds ratio is adjusted for all other variables in the table; No response given to age n=10 (0.8%), place or residence n=4 (0.3%) and children in the household n=3 (0.2%); * p<0.05

519   Table 4: Response frequencies for hazards respondents perceived as <u>most</u> harmful to human reproduction

520   for either men or women.

	Lead	Stress	Carrying and Lifting	Water Pollution	Air Pollution	Don't Know/No response
	%	%	%	%	%	%
Total sample (n=1261)	48.5	32.4	2.1	5.7	6.3	5.0
Gender (n=1261)						
Male	46.5	33.4	2.4	5.5	6.6	5.7
Female	50.5	31.5	1.9	5.9	5.9	4.3
Age Group (n=1251)						
18-34	32.5	43.4	3.0	10.2	7.8	3.0
35-44	45.9	40.4	0.9	2.8	5.5	4.6
45-54	52.9	32.0	1.7	5.5	3.4	4.5
55-64	54.4	27.6	1.4	4.6	7.8	4.2
65+	49.2	25.7	3.6	6.6	7.3	7.6
Place of Residence (n=1257)						
City	50.6	29.0	2.6	6.4	6.6	4.9
Town	43.6	36.1	1.2	5.6	6.2	7.1
Rural	49.6	35.7	1.8	4.3	5.7	2.9
Children in the household (n=1258)						
No	48.9	30.1	2.5	5.9	7.2	5.4
Yes	47.5	36.9	1.6	5.4	4.5	4.1

Note: No response given to age n=10 (0.8%), place or residence n=4 (0.3%) and children in the household n=3 (0.2%)

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