WEBVTT

1 00:00:07.216 --> 00:00:09.966 <v ->Welcome to this special seminar</v>

2 00:00:10.800 --> 00:00:13.340 being sponsored by the Yale Center

3 00:00:13.340 --> 00:00:15.290 on Climate Change in Health.

4 00:00:15.290 --> 00:00:20.290 And it's a pleasure to welcome Daniel Carrión

5 00:00:23.310 --> 00:00:25.910 who is currently a postdoctoral Fellow

6 00:00:25.910 --> 00:00:28.290 in Environmental Medicine and Public Health

7 00:00:28.290 --> 00:00:31.793 at the Icahn School of Medicine at Mount Sinai.

8 00:00:33.040 --> 00:00:35.210 He received his PhD from

9 00:00:35.210 --> 00:00:38.790 Columbia Mailman School of Public Health

10 00:00:38.790 --> 00:00:42.530 from the Department of Environmental Health Sciences

11 00:00:42.530 --> 00:00:45.110 and it was in their Climate and Health Program,

12 00:00:45.110 --> 00:00:50.110 which is a really great program that our own Chi Chen

13 00:00:51.910 --> 00:00:54.533 has been closely associated with in the past.

14 00:00:56.199 --> 00:01:00.110 And so we're really looking forward to Daniel's presentation

15 00:01:00.110 --> 00:01:02.890 on Climate, Energy and Inequity:

16 00:01:02.890 --> 00:01:05.340 from Exposures to Epidemiology.

17 00:01:05.340 --> 00:01:06.563 So, Daniel, welcome.

18 00:01:07.950 --> 00:01:09.283 <v ->Thank you so much.</v>

19 00:01:10.300 --> 00:01:13.030 So I'm excited to speak to you all today

20 00:01:13.030 --> 00:01:16.223 and just by way of a little bit more introduction,

21 00:01:17.130 --> 00:01:22.130 I completed my BA at Ithaca College in 2008,

22 00:01:22.250 --> 00:01:24.540 and if you remember 2008,

23 00:01:24.540 --> 00:01:27.590 that was right when the global recession happened,

24 00:01:27.590 --> 00:01:30.710 so a great time to graduate from college.

25 00:01:30.710 --> 00:01:33.600 So I had two part-time jobs, one where I was working

26 00:01:33.600 --> 00:01:36.290 actually for the Health Department in Tompkins County

27 00:01:36.290 --> 00:01:39.890 in New York state, and the other one where I was working

28 00:01:39.890 --> 00:01:42.240 for the Solid Waste Division where I was doing composting

29 00:01:42.240 --> 00:01:45.260 and recycling education and outreach.

30 00:01:45.260 --> 00:01:46.530 I then ended up leaving

31 00:01:46.530 --> 00:01:48.360 and going to Hudson River Healthcare,

32 00:01:48.360 --> 00:01:52.940 which is a network of federally qualified health centers

33 00:01:52.940 --> 00:01:57.320 across New York state, about 25 at the time,

34 00:01:57.320 --> 00:02:01.530 where I was helping manage outreach

35 00:02:01.530 --> 00:02:05.640 and programming for folks with HIV, folks who were homeless,

36 00:02:05.640 --> 00:02:09.020 folks in public housing, and migrant farm workers.

37 00:02:09.020 --> 00:02:11.507 I was concurrently doing my masters in public health

38 00:02:11.507 --> 00:02:13.200 and environmental health sciences

39 00:02:13.200 --> 00:02:15.360 at New York Medical College.

40 00:02:15.360 --> 00:02:17.590 And then after completing my MPH

41 00:02:17.590 --> 00:02:20.940 ended up leaving to go to Columbia university

42 00:02:20.940 --> 00:02:24.170 where I started a pipeline program called

43 00:02:24.170 --> 00:02:26.370 the Summer Public Health Scholars program,

44 00:02:26.370 --> 00:02:29.760 a CDC funded program to increase the diversity

45 00:02:29.760 --> 00:02:31.910 of the public health workforce,

46 00:02:31.910 --> 00:02:33.653 specifically around health equity.

47 00:02:34.680 --> 00:02:38.380 I then started my PhD as Rob mentioned

48 00:02:38.380 --> 00:02:41.980 in the department of environmental health sciences

49 00:02:41.980 --> 00:02:44.108 and the climate and health program

50 00:02:44.108 --> 00:02:46.649 and completed that in 2019.

51 00:02:46.649 --> 00:02:51.350 And then now at the Icahn School of Medicine as a post-doc.

52 00:02:51.350 --> 00:02:55.600 And so I'm excited to tell you about the work that I've done

53 00:02:55.600 --> 00:02:59.140 in the most recent part of this journey,

54 00:02:59.140 --> 00:03:03.010 which I characterize being at this nexus of climate energy

55 00:03:03.010 --> 00:03:05.020 and health inequity.

56 00:03:05.020 --> 00:03:09.240 So we all know that energy lies at the source of our climate

57 00:03:09.240 --> 00:03:13.310 crisis, societal decisions on where we derive energy,

58 00:03:13.310 --> 00:03:18.310 how much we need and what we use it for

59 00:03:19.260 --> 00:03:23.040 are all leading to increasing global temperatures

60 00:03:23.040 --> 00:03:26.593 that we have been observing and we'll continue to see.

61 00:03:28.440 --> 00:03:30.810 But we've run a dynamic tension here, right?

62 00:03:30.810 --> 00:03:34.780 Because energy is fundamental to public health.

63 00:03:34.780 --> 00:03:38.260 It's fundamental for folks to stay healthy,

64 00:03:38.260 --> 00:03:40.730 from the energy that we use to cook with,

65 00:03:40.730 --> 00:03:44.400 to the energy that we use in the winter to stay warm,

66 00:03:44.400 --> 00:03:48.700 to the energy that we use in the summer to stay cool,

67 00:03:48.700 --> 00:03:51.080 we need energy.

68 00:03:51.080 --> 00:03:53.300 And so I've been fortunate to work in all three

69 00:03:53.300 --> 00:03:55.763 of these spaces, thinking about this,

70 00:03:55.763 --> 00:03:59.010 these energy tensions in public health,

71 00:03:59.010 --> 00:04:00.430 but for the scope of this talk,

72 00:04:00.430 --> 00:04:03.230 I'm going to only tell you about two of them,

73 00:04:03.230 --> 00:04:05.410 which is about my work in household energy and air

74 00:04:05.410 --> 00:04:07.310 pollution related to cooking,

75 00:04:07.310 --> 00:04:10.040 and then more recently temperature epidemiology

76 00:04:10.040 --> 00:04:11.813 from summertime temperatures.

77 00:04:14.350 --> 00:04:18.370 So quickly about my dissertation work and household energy

78 00:04:18.370 --> 00:04:21.473 and air pollution in low and middle income countries.

79 00:04:22.450 --> 00:04:27.450 As background, 3 billion people around the world

80 00:04:27.690 --> 00:04:29.900 experience energy poverty,

81 00:04:29.900 --> 00:04:34.070 which is characterized by cooking and or heating with wood,

82 00:04:34.070 --> 00:04:38.053 dung, charcoal, or other biomass fuels.

83 00:04:39.630 --> 00:04:44.500 And although the proportion is decreasing overall

84 00:04:44.500 --> 00:04:48.940 of the population that relies on these fuels

85 00:04:48.940 --> 00:04:50.620 because of population growth,

86 00:04:50.620 --> 00:04:55.000 the absolute counts are actually increasing and the highest

87 00:04:55.000 --> 00:04:57.853 increases are actually in Sub-Saharan Africa.

88 00:04:59.010 --> 00:05:03.080 And so this is the stove that you would see in many parts

89 00:05:03.080 --> 00:05:07.800 of Sub-Saharan Africa, it's called the three stone fire,

90 00:05:07.800 --> 00:05:11.140 which you might guess because there are three stones

91 00:05:11.140 --> 00:05:15.133 that prop up a pot and underneath biomass is combusted.

92 00:05:18.080 --> 00:05:20.680 We're concerned about this because the combustion of that

93 00:05:20.680 --> 00:05:25.680 biomass leads to a mixture of compounds collectively

94 00:05:25.820 --> 00:05:29.050 referred to as household air pollution.

95 00:05:29.050 --> 00:05:33.560 And so that comprises CO2 particulate matter,

96 00:05:33.560 --> 00:05:35.030 carbon monoxide,

97 00:05:35.030 --> 00:05:39.580 polycyclic aromatic hydrocarbons amongst others,

98 00:05:39.580 --> 00:05:43.300 and both the deforestation associated with biomass

99 00:05:43.300 --> 00:05:47.000 harvesting depending on country and the combustion

100 00:05:47.000 --> 00:05:50.343 are projected to actually contribute to climate change.

101 00:05:52.390 --> 00:05:55.930 And we also know that exposure to household air pollution

102 00:05:55.930 --> 00:05:59.530 is associated premature deaths each year,

103 00:05:59.530 --> 00:06:02.530 millions of premature deaths each year,

104 00:06:02.530 --> 00:06:07.300 the largest proportion from lower respiratory infections.

105 00:06:07.300 --> 00:06:10.390 And you might know that lower respiratory infections

106 00:06:10.390 --> 00:06:12.840 are actually the leading killer of children

107 00:06:12.840 --> 00:06:16.330 under five in lower and middle income countries.

108 00:06:16.330 --> 00:06:19.370 And so it's widely agreed that the solution here

109 00:06:19.370 --> 00:06:22.920 is to scale up cleaner cooking alternatives

110 00:06:22.920 --> 00:06:27.233 like liquified petroleum, gas, electric, and induction.

111 00:06:29.650 --> 00:06:32.700 And in Ghana, as in many other countries,

112 00:06:32.700 --> 00:06:37.170 LPG represents the cheapest and most accessible options

113 00:06:37.170 --> 00:06:41.560 of the three that I just mentioned because the other two

114 00:06:41.560 --> 00:06:45.570 electric and induction requires stable and extensive

115 00:06:45.570 --> 00:06:47.980 electricity grids that don't exist

116 00:06:47.980 --> 00:06:49.573 in many parts of the world.

117 00:06:50.420 --> 00:06:52.260 But if you're unfamiliar with this literature,

118 00:06:52.260 --> 00:06:55.125 I would understand if some folks in the audience

119 00:06:55.125 --> 00:06:59.480 are confused at how using a fossil fuel can actually help us

120 00:06:59.480 --> 00:07:00.883 fight climate change.

121 00:07:03.600 --> 00:07:06.330 The atmospheric science behind this is complicated

122 00:07:06.330 --> 00:07:09.160 and outside the scope of my talk today,

123 00:07:09.160 --> 00:07:12.270 but rest assured that the international panel on climate

124 00:07:12.270 --> 00:07:16.110 change indicates that activities consistent

125 00:07:16.110 --> 00:07:19.380 with the greenhouse gas emission reductions needed

126 00:07:19.380 --> 00:07:23.020 for a warming of 1.5 degrees Celsius

127 00:07:24.180 --> 00:07:28.780 world includes transitions to clean cookstoves

128 00:07:28.780 --> 00:07:32.363 that are gas based or electric based.

129 00:07:33.353 --> 00:07:37.330 And unfortunately, atmosphere projections

130 00:07:37.330 --> 00:07:40.490 that are Ghana-specific are actually unavailable

131 00:07:40.490 --> 00:07:45.450 at the moment, but one done in Cameroon

132 00:07:45.450 --> 00:07:48.960 undergoing a similar LPG transition

133 00:07:48.960 --> 00:07:53.710 shows that there are projected net cooling benefits

134 00:07:53.710 --> 00:07:58.140 of switching to LPG rather than continued use

135 00:07:58.140 --> 00:08:00.370 of biomass fuels.

136 00:08:00.370 --> 00:08:04.321 And so this then represents in many parts of the world

137 00:08:04.321 --> 00:08:06.730 climate mitigation opportunity

138 00:08:06.730 --> 00:08:09.513 with potential health co-benefits.

139 00:08:11.660 --> 00:08:14.910 And so my thesis works set out to try and provide evidence

140 00:08:14.910 --> 00:08:18.030 to support clean cooking efforts.

141 00:08:18.030 --> 00:08:19.540 The relationship between energy,

142 00:08:19.540 --> 00:08:22.900 poverty and disease can be described as a pathway

143 00:08:22.900 --> 00:08:26.600 from poverty to energy poverty,

144 00:08:26.600 --> 00:08:29.670 which then causes household air pollution,

145 00:08:29.670 --> 00:08:32.580 and then the exposure to that household air pollution

146 00:08:32.580 --> 00:08:35.203 leads to a whole host of diseases.

147 00:08:36.260 --> 00:08:39.460 And there are particularly three parts of this pathway

148 00:08:39.460 --> 00:08:43.610 that we can try to interrupt in this relationship

149 00:08:43.610 --> 00:08:46.363 between poverty and disease in this context.

150 00:08:47.210 --> 00:08:50.990 So we can focus on making the clean available,

151 00:08:50.990 --> 00:08:54.860 which is a moniker from the late Kirk Smith,

152 00:08:54.860 --> 00:08:57.570 essentially saying identifying interventions

153 00:08:57.570 --> 00:09:00.140 to increase the uptake of clean cookstoves

154 00:09:00.140 --> 00:09:02.493 like induction or LPG.

155 00:09:04.310 --> 00:09:06.210 We could interrupt this part of the pathway,

156 00:09:06.210 --> 00:09:10.717 which is to make the available clean by identifying ways

157 00:09:10.717 --> 00:09:15.010 to reduce exposures from biomass combustion,

158 00:09:15.010 --> 00:09:18.700 such as improved cookstoves that have interventions

159 00:09:18.700 --> 00:09:21.200 like increasing ventilation,

160 00:09:21.200 --> 00:09:24.083 thereby increasing the efficiency of combustion.

161 00:09:26.140 --> 00:09:29.600 And then finally, we can do health research

162 00:09:29.600 --> 00:09:31.670 to understand biological pathways

163 00:09:31.670 --> 00:09:35.313 for improved treatments or interventions.

164 00:09:37.770 --> 00:09:41.040 My work was particularly focused on these two parts

165 00:09:41.040 --> 00:09:45.840 of the pathway, and I'll quickly sum up my dissertation

166 00:09:45.840 --> 00:09:50.790 in one slide, which is the first paper

167 00:09:50.790 --> 00:09:53.740 in my dissertation was where I

168 00:09:53.740 --> 00:09:58.310 created a new framework to try and understand why recipients

169 00:09:58.310 --> 00:10:01.430 of new cookstoves often end up

170 00:10:01.430 --> 00:10:04.160 stopping using those cookstoves

171 00:10:04.160 --> 00:10:08.680 and we refer to this as stove use discontinuance.

172 00:10:08.680 --> 00:10:11.480 Acknowledging that a lot of people who receive

173 00:10:11.480 --> 00:10:16.480 new cookstoves end up stopping their use in the longer term,

174 00:10:17.400 --> 00:10:21.290 we ended up then trying to design an intervention

175 00:10:21.290 --> 00:10:23.610 to support a government effort.

176 00:10:23.610 --> 00:10:28.540 So the government actually freely distributes LPG stoves

177 00:10:28.540 --> 00:10:30.550 in rural areas in Ghana.

178 00:10:30.550 --> 00:10:35.550 And so we designed and implemented an intervention

179 00:10:36.170 --> 00:10:39.623 to try and increase the long-term use of those stoves.

180 00:10:40.660 --> 00:10:43.890 The findings suggest that more fundamental policy changes

181 00:10:43.890 --> 00:10:48.890 are actually needed just rather than a simple intervention.

182 00:10:49.080 --> 00:10:53.520 And finally understanding biological pathways

183 00:10:53.520 --> 00:10:55.870 from data from a cohort study,

184 00:10:55.870 --> 00:11:00.330 we used banked nasal swabs from infants

185 00:11:00.330 --> 00:11:02.750 of the age of one or less

186 00:11:02.750 --> 00:11:05.740 and found that household air pollution is associated

187 00:11:05.740 --> 00:11:10.660 with increased presence of bacterial and not viral microbes.

188 00:11:10.660 --> 00:11:13.800 And this is important because there's other literature

189 00:11:13.800 --> 00:11:17.380 that otherwise indicates that household air pollution may be

190 00:11:17.380 --> 00:11:21.310 contributing to bacterial forms of pneumonia

191 00:11:21.310 --> 00:11:23.290 and not viral forms of pneumonia

192 00:11:23.290 --> 00:11:26.620 and so this is trying to understand that ideological pathway

193 00:11:26.620 --> 00:11:27.620 a little bit better.

194 00:11:30.760 --> 00:11:35.120 So with that very brief overview of my thesis work,

195 00:11:35.120 --> 00:11:38.690 I wanted to spend more time on my current portfolio,

196 00:11:38.690 --> 00:11:40.900 which is focused on ambient temperature,

197 00:11:40.900 --> 00:11:44.203 temperature epidemiology, and energy insecurity.

198 00:11:47.250 --> 00:11:50.760 And the motivation here is simple.

199 00:11:50.760 --> 00:11:52.370 We're living it right now.

200 00:11:52.370 --> 00:11:55.800 Climate change means that there's an increased frequency

201 00:11:55.800 --> 00:11:58.540 and intensity of extreme heat events

202 00:11:58.540 --> 00:12:00.890 and hotter average summers.

203 00:12:00.890 --> 00:12:04.620 And we know that those higher temperatures are associated

204 00:12:04.620 --> 00:12:08.310 with a whole host of health outcomes from cardiovascular

205 00:12:08.310 --> 00:12:10.780 to respiratory, to renal,

206 00:12:10.780 --> 00:12:15.090 to even violence and other non-health outcomes,

207 00:12:15.090 --> 00:12:19.053 but still very health relevant like educational performance.

208 00:12:20.340 --> 00:12:24.330 And there's also work that shows that increased ambient

209 00:12:24.330 --> 00:12:27.640 temperatures are associated with perinatal outcomes

210 00:12:27.640 --> 00:12:29.760 like pre-term birth.

211 00:12:29.760 --> 00:12:31.730 And there's an important opportunity here

212 00:12:31.730 --> 00:12:34.980 because temperature epi has been largely focused

213 00:12:34.980 --> 00:12:37.440 on older adult populations

214 00:12:37.440 --> 00:12:41.120 and so there's an opportunity to grow the literature

215 00:12:41.120 --> 00:12:43.883 thinking about pediatric populations.

216 00:12:46.560 --> 00:12:48.940 So I first want to tell you about a study

217 00:12:48.940 --> 00:12:50.890 that we're wrapping up right now,

218 00:12:50.890 --> 00:12:54.820 thinking about the case process over design as a way

219 00:12:54.820 --> 00:12:58.200 of studying the relationship between ambient temperature

220 00:12:58.200 --> 00:12:59.623 and preterm birth.

221 00:13:04.450 --> 00:13:06.350 And the motivation here

222 00:13:06.350 --> 00:13:10.100 I think is also simple for a public health crowd.

223 00:13:10.100 --> 00:13:15.100 That preterm birth is a major health outcome

224 00:13:15.850 --> 00:13:19.460 that's associated with high infant mortality.

225 00:13:19.460 --> 00:13:22.710 It's also one of the most pronounced and persistent

226 00:13:22.710 --> 00:13:25.680 racial disparities that we know of,

227 00:13:25.680 --> 00:13:29.220 and it not only represents poor health

228 00:13:29.220 --> 00:13:32.830 potentially in the immediacy of birth,

229 00:13:32.830 --> 00:13:36.890 but also potentially a trajectory of poor health

230 00:13:36.890 --> 00:13:38.500 in the longterm.

231 00:13:38.500 --> 00:13:42.650 Many of the health outcomes are also health disparities

232 00:13:42.650 --> 00:13:43.933 for communities of color.

233 00:13:45.030 --> 00:13:47.510 And there's a growing literature on the relationship

234 00:13:47.510 --> 00:13:50.700 between ambient temperature and preterm birth.

235 00:13:50.700 --> 00:13:53.960 One of the initial studies identifying this association

236 00:13:53.960 --> 00:13:57.670 was actually from Bosu at all in 2010,

237 00:13:57.670 --> 00:14:00.010 a study based in California using

238 00:14:00.010 --> 00:14:02.083 the case crossover study design.

239 00:14:04.380 --> 00:14:07.020 So if you're unfamiliar with the case crossover study

240 00:14:07.020 --> 00:14:09.460 design, a quick introduction.

241 00:14:09.460 --> 00:14:14.460 It's a case-only study design that compares the case time

242 00:14:15.110 --> 00:14:19.600 to control times when the event did not happen.

243 00:14:19.600 --> 00:14:23.310 And it's been widely used in air pollution epidemiology

244 00:14:23.310 --> 00:14:26.363 and is increasingly used in temperature epidemiology.

245 00:14:28.210 --> 00:14:31.393 It's a temporal comparison,

246 00:14:32.380 --> 00:14:35.470 meaning that it's comparing the same person to themselves

247 00:14:35.470 --> 00:14:37.290 at different time points.

248 00:14:37.290 --> 00:14:41.010 And so a real perk there is that then it's not vulnerable

249 00:14:41.010 --> 00:14:43.663 to person level forms of confounding.

250 00:14:47.210 --> 00:14:52.210 However, proper control selection is then pivotal for proper

251 00:14:52.810 --> 00:14:55.400 inference because you want to make sure that you

252 00:14:55.400 --> 00:14:58.700 are controlling for potential temporal confounders

253 00:14:58.700 --> 00:15:01.760 and other temporal forms of bias.

254 00:15:01.760 --> 00:15:06.760 And a key assumption of this design is that there are no

255 00:15:07.310 --> 00:15:10.890 trends in the risk of the outcome over time.

256 00:15:10.890 --> 00:15:14.032 And it was actually pointed out in a commentary

257 00:15:14.032 --> 00:15:17.890 from that original Bosu paper that I mentioned

258 00:15:17.890 --> 00:15:21.720 that preterm birth actually violates this assumption.

259 00:15:21.720 --> 00:15:25.150 And this should be pretty intuitive to folks in the audience

260 00:15:25.150 --> 00:15:29.680 because the risk of birth changes

261 00:15:29.680 --> 00:15:32.910 pretty secularly over gestation.

262 00:15:32.910 --> 00:15:35.070 And so this is something that we need to think about

263 00:15:35.070 --> 00:15:37.764 if we're using this study design

264 00:15:37.764 --> 00:15:42.333 for ambient environmental exposures.

265 00:15:44.910 --> 00:15:48.730 However six other studies have employed this study design

266 00:15:48.730 --> 00:15:52.400 for preterm birth since 2010,

267 00:15:52.400 --> 00:15:55.780 specifically for ambient temperature that we're aware of.

268 00:15:55.780 --> 00:15:58.030 And I'm sure that number is much higher

269 00:15:58.030 --> 00:16:01.573 if we also consider air pollution.

270 00:16:05.550 --> 00:16:09.890 So that this was a great opportunity for a simulation study.

271 00:16:09.890 --> 00:16:11.510 So for those who are unfamiliar,

272 00:16:11.510 --> 00:16:15.080 a simulation study are essentially computational experiments

273 00:16:15.080 --> 00:16:18.750 where we can test the behavior of our epidemiological

274 00:16:18.750 --> 00:16:21.653 studies under controlled circumstances.

275 00:16:23.240 --> 00:16:28.200 So first what we do is we create a dataset and then we embed

276 00:16:28.200 --> 00:16:31.940 a known association in that dataset.

277 00:16:31.940 --> 00:16:34.990 We then test our epidemiological analysis'

278 00:16:34.990 --> 00:16:38.040 ability to recover that association.

279 00:16:38.040 --> 00:16:39.520 Then we try to repeat,

280 00:16:39.520 --> 00:16:43.110 or we repeat this a thousand times to represent

281 00:16:43.110 --> 00:16:47.160 some of the stochasticity of the underlying distribution.

282 00:16:47.160 --> 00:16:49.170 And then we could see if different strategies

283 00:16:49.170 --> 00:16:50.950 or specifications of models

284 00:16:50.950 --> 00:16:53.583 can actually improve our inference.

285 00:16:55.750 --> 00:16:59.390 More specific, what data did I use to do this?

286 00:16:59.390 --> 00:17:02.865 Well, LaGuardia Airport has temperature data

287 00:17:02.865 --> 00:17:06.040 readily available for download online.

288 00:17:06.040 --> 00:17:08.650 So we downloaded LaGuardia temperature data

289 00:17:08.650 --> 00:17:10.943 as our exposure data.

290 00:17:12.210 --> 00:17:15.980 And then for our health data, we actually downloaded CDC

291 00:17:15.980 --> 00:17:20.980 wonder data to create estimates of daily preterm births

292 00:17:21.510 --> 00:17:26.510 by gestational age from 20 to 36 weeks.

293 00:17:27.860 --> 00:17:30.350 And just as a quick definitional thing,

294 00:17:30.350 --> 00:17:33.810 preterm birth is generally a birth that take place

295 00:17:33.810 --> 00:17:35.733 before 37 weeks.

296 00:17:36.720 --> 00:17:41.720 We got these data for 2007 and 2018 from,

297 00:17:42.080 --> 00:17:46.010 and then we created data sets with a range

298 00:17:46.010 --> 00:17:51.010 of simulated effects ranging from 0.9 to 1.25.

299 00:17:51.210 --> 00:17:53.490 I don't think anyone thinks that temperature

300 00:17:53.490 --> 00:17:56.080 is protective of preterm birth,

301 00:17:56.080 --> 00:18:00.500 but we wanted to see how malleable these models

302 00:18:00.500 --> 00:18:03.163 were to different underlying assumptions.

303 00:18:05.550 --> 00:18:10.220 And then we do these case crossovers to see how our model

304 00:18:10.220 --> 00:18:13.980 does at recovering the simulated effects.

305 00:18:13.980 --> 00:18:17.640 We ended up doing this using a time stratified control

306 00:18:17.640 --> 00:18:21.290 selection for three different time periods.

307 00:18:21.290 --> 00:18:24.380 So we did it for a two week time stratified,

308 00:18:24.380 --> 00:18:28.850 a 28 day time stratified, and a month time stratified.

309 00:18:28.850 --> 00:18:33.140 And we limit our case crossover to warm month analyses,

310 00:18:33.140 --> 00:18:36.040 which is consistent with other studies in this literature.

311 00:18:37.870 --> 00:18:40.680 And again, we do this a thousand times to kind of represent

312 00:18:40.680 --> 00:18:43.580 some of that stochasticity of the underlying distrobution.

313 00:18:45.940 --> 00:18:50.110 So these are the input data that we use.

314 00:18:50.110 --> 00:18:54.860 So up here are, is the temperature data

315 00:18:54.860 --> 00:18:56.680 from LaGuardia Airport

316 00:18:57.530 --> 00:19:00.940 and down here are the estimated number of births

317 00:19:00.940 --> 00:19:05.660 on a given day that we used from the CDC wonder database.

318 00:19:05.660 --> 00:19:08.040 And then this orange region

319 00:19:08.040 --> 00:19:12.193 is the warm month time period that we used.

320 00:19:14.640 --> 00:19:16.920 So the main result that I'm showing you here

321 00:19:16.920 --> 00:19:19.520 is for absolute bias.

322 00:19:19.520 --> 00:19:22.690 And so absolute bias is simply the difference between

323 00:19:22.690 --> 00:19:26.810 the simulated relative risk with the coefficient that we get

324 00:19:26.810 --> 00:19:29.913 from the case crossover in the log scale.

325 00:19:31.020 --> 00:19:34.160 And I'm showing you first a relative risk of one,

326 00:19:34.160 --> 00:19:38.320 meaning that there's no association between temperature

327 00:19:38.320 --> 00:19:39.920 and preterm birth.

328 00:19:39.920 --> 00:19:43.320 And you could see that using all three of these study

329 00:19:43.320 --> 00:19:48.260 designs, we actually get relatively unbiased results

330 00:19:48.260 --> 00:19:51.463 with the medians hovering around zero.

331 00:19:53.610 --> 00:19:57.540 If we look across the entire range of our embedded effects,

332 00:19:57.540 --> 00:20:01.880 we see relatively consistent results where all three

333 00:20:01.880 --> 00:20:06.880 of these case control selection designs actually yield

334 00:20:07.140 --> 00:20:11.650 relatively unbiased results, with our two-week stratified,

335 00:20:11.650 --> 00:20:16.300 yielding the noisiest results characterized here

336 00:20:16.300 --> 00:20:19.703 by a wider intercore tile range.

337 00:20:20.750 --> 00:20:22.950 And then when we looked at coverage,

338 00:20:22.950 --> 00:20:26.070 so coverage would be the coverage

339 00:20:26.070 --> 00:20:29.297 of the 95% confidence intervals.

340 00:20:29.297 --> 00:20:32.950 What percentage of the time does the confidence interval

341 00:20:32.950 --> 00:20:36.240 actually include the true embedded effect?

342 00:20:36.240 --> 00:20:38.690 And you would hope for a model that that would be

343 00:20:39.542 --> 00:20:41.220 consistently 95% of the time.

344 00:20:41.220 --> 00:20:45.120 And indeed we see that these models are relatively stable

345 00:20:45.120 --> 00:20:50.120 with approximately 95% at all of these risks embedded.

346 00:20:54.760 --> 00:20:59.760 So this is really important work because this shores up

347 00:21:00.160 --> 00:21:01.930 the evidence that we have

348 00:21:01.930 --> 00:21:04.520 for the case crossover study design

349 00:21:04.520 --> 00:21:09.520 and ambient exposures and preterm birth,

350 00:21:09.810 --> 00:21:11.860 which I think is really important.

351 00:21:11.860 --> 00:21:15.320 We ended up doing 24,000 simulations and corresponding

352 00:21:15.320 --> 00:21:18.100 case crossovers, finding that the models

353 00:21:18.100 --> 00:21:20.270 are relatively unbiased.

354 00:21:20.270 --> 00:21:23.560 And we're excited about wrapping up this project

355 00:21:23.560 --> 00:21:27.240 because we've tried to enhance reproducibility

356 00:21:27.240 --> 00:21:31.450 of our findings and results by using the targets package

357 00:21:31.450 --> 00:21:36.450 in R, which then means that other folks

358 00:21:36.650 --> 00:21:41.650 can go and rerun these analyses and can actually swap out

359 00:21:41.710 --> 00:21:44.980 different years or regions and their analysis,

360 00:21:44.980 --> 00:21:48.863 which aids an extensibility of this analysis.

361 00:21:50.060 --> 00:21:54.960 And now we're actually using the case crossover analysis

362 00:21:56.050 --> 00:21:58.900 to think about a national level analysis

363 00:21:58.900 --> 00:22:02.420 that we're doing actually in Mexico

364 00:22:02.420 --> 00:22:04.973 and hopefully future studies in the U.S. as well.

365 00:22:08.270 --> 00:22:10.880 But much the same way that we're thinking about

366 00:22:10.880 --> 00:22:14.550 epidemiological methods, we're also thinking about improving

367 00:22:14.550 --> 00:22:16.710 our exposure methods.

368 00:22:16.710 --> 00:22:18.980 And so here, I want to tell you about a project

369 00:22:18.980 --> 00:22:20.790 that we just published on,

370 00:22:20.790 --> 00:22:24.460 thinking about a one kilometer hourly air temperature model

371 00:22:24.460 --> 00:22:26.950 across the Northeastern United States

372 00:22:26.950 --> 00:22:29.300 from Maine to Virginia

373 00:22:29.300 --> 00:22:32.820 and this is fusing ground data

374 00:22:32.820 --> 00:22:35.163 with satellite remote sensing data.

375 00:22:37.200 --> 00:22:42.200 And the inspiration for me here is that there is a small,

376 00:22:43.200 --> 00:22:46.800 but growing literature on temperature disparities,

377 00:22:46.800 --> 00:22:51.627 that temperature is perhaps unevenly experienced

378 00:22:51.627 --> 00:22:55.960 based on race, ethnicity, income,

379 00:22:55.960 --> 00:22:59.640 and other forms of potential vulnerability.

380 00:22:59.640 --> 00:23:03.810 And so one limitation, however,

381 00:23:03.810 --> 00:23:07.520 with some of these past studies is that they either use land

382 00:23:07.520 --> 00:23:10.260 surface temperature, which is remotely sensed

383 00:23:10.260 --> 00:23:13.780 with satellites and related to air temperature,

384 00:23:13.780 --> 00:23:16.470 but not exactly air temperature,

385 00:23:16.470 --> 00:23:20.590 or they use forms of land cover,

386 00:23:20.590 --> 00:23:24.470 and land use that are associated with temperature,

387 00:23:24.470 --> 00:23:27.960 but again, not empirical measures of temperature

388 00:23:27.960 --> 00:23:32.350 and so an opportunity then to try and grow this literature,

389 00:23:32.350 --> 00:23:35.943 thinking about these potential temperature disparities.

390 00:23:38.760 --> 00:23:42.360 So the goal here is to create this one kilometer

391 00:23:42.360 --> 00:23:44.410 hourly air temperature model

392 00:23:44.410 --> 00:23:46.350 to be able to produce predictions

393 00:23:46.350 --> 00:23:51.350 between the time period of 2003 to 2019.

394 00:23:51.440 --> 00:23:54.730 So we ended up using national oceanic,

395 00:23:54.730 --> 00:23:59.600 atmospheric and atmospheric administration data

396 00:23:59.600 --> 00:24:02.510 for ground stations throughout this region

397 00:24:02.510 --> 00:24:05.350 as our ground truths for air temperature.

398 00:24:05.350 --> 00:24:07.890 And so that's what's depicted in red

399 00:24:07.890 --> 00:24:09.500 across our study region.

400 00:24:09.500 --> 00:24:13.470 These are the locations of all of the ground sensors

401 00:24:13.470 --> 00:24:16.260 that we used in our model.

402 00:24:16.260 --> 00:24:20.528 We then collected 34 predictors that we thought

403 00:24:20.528 --> 00:24:24.490 would help us characterize the spatial and temporal patterns

404 00:24:24.490 --> 00:24:27.853 of cooling and heating throughout the day.

405 00:24:28.768 --> 00:24:32.230 And the goal here is to be able to create consistent

406 00:24:32.230 --> 00:24:36.090 and reliable predictions of air temperature across

407 00:24:36.090 --> 00:24:38.020 this region, even in places

408 00:24:38.020 --> 00:24:41.163 that we don't have ground observations.

409 00:24:46.150 --> 00:24:49.990 So we tested five different statistical approaches

410 00:24:49.990 --> 00:24:54.557 to actually create these predictions

411 00:24:54.557 --> 00:24:59.320 and show their differences in performance in our paper.

412 00:24:59.320 --> 00:25:00.870 For the sake of time,

413 00:25:00.870 --> 00:25:03.060 I'm just going to tell you the punchline,

414 00:25:03.060 --> 00:25:06.820 which is that we ended up using the XG boost model

415 00:25:06.820 --> 00:25:09.100 for our final predictions.

416 00:25:09.100 --> 00:25:14.070 So the XG boost model is a powerful machine learning model

417 00:25:14.070 --> 00:25:18.610 that we used and had to adapt to create

418 00:25:18.610 --> 00:25:21.563 a spatial temporal predictions.

419 00:25:23.390 --> 00:25:26.970 And what we ended up doing was actually comparing

420 00:25:26.970 --> 00:25:31.970 our XG boost model to the NLDAS-2 model.

421 00:25:32.410 --> 00:25:36.600 So NLDAS-2, if you're unfamiliar is a NASA product

422 00:25:36.600 --> 00:25:39.490 that also gives hourly predictions

423 00:25:39.490 --> 00:25:43.310 and it's what the CDC uses for their heat and health

424 00:25:43.310 --> 00:25:47.960 tracking system, as well as some of their research.

425 00:25:47.960 --> 00:25:50.550 And so we thought that this was an important model

426 00:25:50.550 --> 00:25:52.003 to benchmark again.

427 00:25:56.130 --> 00:25:59.210 So these are the predictions from our XG boost model,

428 00:25:59.210 --> 00:26:03.620 from the hottest midnight of our data set, July 22nd, 2011.

429 00:26:04.970 --> 00:26:08.980 And so you can see across this Northeast region

430 00:26:08.980 --> 00:26:11.090 from Virginia to Maine,

431 00:26:11.090 --> 00:26:15.163 that we reconstruct a great deal of spatial heterogeneity.

432 00:26:16.530 --> 00:26:18.750 Again, this is for one hour,

433 00:26:18.750 --> 00:26:23.120 the highest midnight of our time period.

434 00:26:23.120 --> 00:26:28.120 And when we zoom in to a sub region,

435 00:26:28.700 --> 00:26:31.163 this, in this case being New York City,

436 00:26:33.500 --> 00:26:37.120 we see that we reconstruct a great deal of spatial

437 00:26:37.120 --> 00:26:41.063 heterogeneity from the urban heat island effect.

438 00:26:42.410 --> 00:26:45.060 And I should have mentioned earlier,

439 00:26:45.060 --> 00:26:48.790 I mentioned that NLDAS-2 is hourly,

440 00:26:48.790 --> 00:26:52.520 but it's actually at a much coarser spatial resolution.

441 00:26:52.520 --> 00:26:57.520 So these larger grid cells overlaid our predictions

442 00:26:57.650 --> 00:27:01.680 are actually the NLDAS-2 grid cells.

443 00:27:01.680 --> 00:27:06.190 And it's important to note here that in this one,

444 00:27:06.190 --> 00:27:10.200 NLDAS-2 grid cell, you have most of Manhattan,

445 00:27:10.200 --> 00:27:13.610 a big chunk of the Bronx and a little bit of Queens

446 00:27:13.610 --> 00:27:18.240 that would get one prediction for all of that region,

447 00:27:18.240 --> 00:27:20.970 with the NLDAS-2 predictions,

448 00:27:20.970 --> 00:27:24.790 but we can reconstruct a great deal of heterogeneity

449 00:27:24.790 --> 00:27:26.543 within that region.

450 00:27:29.210 --> 00:27:32.360 And we think that that then is related

451 00:27:32.360 --> 00:27:34.890 to the performance of these models.

452 00:27:34.890 --> 00:27:39.890 So these are the root mean squared errors from just 2019

453 00:27:39.960 --> 00:27:44.960 from our XG boost model versus the NLDAS-2 model.

454 00:27:45.520 --> 00:27:50.520 So RMSE is a measure of predictive accuracy and the goal

455 00:27:51.230 --> 00:27:53.920 is to have lower RMSEs.

456 00:27:53.920 --> 00:27:56.450 And so we show that our model

457 00:27:56.450 --> 00:28:01.160 has a low RMSE of 1.4 Celsius,

458 00:28:01.160 --> 00:28:06.160 whereas the NLDAS-2 model has a RMSE of 2.4 Celsius.

459 00:28:08.870 --> 00:28:13.720 When we look across the entire region across all years,

460 00:28:13.720 --> 00:28:17.420 we see that the XG boost predictions have one third

461 00:28:17.420 --> 00:28:22.273 of the mean squared error of the NLDAS-2 predictions.

462 00:28:25.960 --> 00:28:28.950 But given the small literature on temperature disparities,

463 00:28:28.950 --> 00:28:32.880 we were curious to see if our model was also associated

464 00:28:32.880 --> 00:28:36.540 with a measure of social vulnerability.

465 00:28:36.540 --> 00:28:41.540 And so what we decided to do was actually conduct a limited

466 00:28:41.750 --> 00:28:46.030 application to look at the relationship between our model

467 00:28:46.030 --> 00:28:51.030 and the NLDAS-2 model with social vulnerability.

468 00:28:51.950 --> 00:28:56.150 So what we did was we used the CDCs social vulnerability

469 00:28:56.150 --> 00:29:01.150 index, which are a composite of 15 census variables,

470 00:29:01.680 --> 00:29:06.680 including socioeconomic status, housing, transportation,

471 00:29:06.760 --> 00:29:11.760 language isolation, amongst other characteristics.

472 00:29:12.063 --> 00:29:16.010 And these are variables that the CDC uses to identify

473 00:29:16.010 --> 00:29:19.210 communities that may need support before,

474 00:29:19.210 --> 00:29:22.540 during or after a disaster.

475 00:29:22.540 --> 00:29:25.620 The results from the social vulnerability index

476 00:29:25.620 --> 00:29:27.530 are proportional.

477 00:29:27.530 --> 00:29:31.490 It produces measures from zero to one.

478 00:29:31.490 --> 00:29:36.490 And so we decided to use mixed models

479 00:29:36.620 --> 00:29:41.620 to associate our XG boost model and the NLDAS model

480 00:29:42.670 --> 00:29:47.400 with social vulnerability to see how they were associated

481 00:29:47.400 --> 00:29:51.410 with social vulnerability at the census tract level.

482 00:29:51.410 --> 00:29:53.730 We wanted this to be a limited application

483 00:29:53.730 --> 00:29:58.230 so we only did it for one hour of one day from that hottest

484 00:29:58.230 --> 00:30:00.653 midnight that I showed you earlier.

485 00:30:03.750 --> 00:30:06.893 And here are the results.

486 00:30:06.893 --> 00:30:08.500 So, as I mentioned earlier,

487 00:30:08.500 --> 00:30:12.010 the CDC social vulnerability index is a proportional measure

488 00:30:12.010 --> 00:30:13.780 from zero to one.

489 00:30:13.780 --> 00:30:18.500 And so for a unit increase of the CDC SVI,

490 00:30:19.600 --> 00:30:23.500 we see that the NLDAS-2 model shows an increase

491 00:30:23.500 --> 00:30:27.520 of temperature of 0.18 Celsius.

492 00:30:27.520 --> 00:30:30.250 However, when we look at the XG boost model,

493 00:30:30.250 --> 00:30:35.030 we see that our model has a stronger relationship

494 00:30:35.030 --> 00:30:36.840 with an increase in temperature,

495 00:30:36.840 --> 00:30:41.833 average temperature of 0.71 Celsius.

496 00:30:44.380 --> 00:30:48.610 And just to ground that in some places that you might know,

497 00:30:48.610 --> 00:30:52.410 so if we look at New York City,

498 00:30:52.410 --> 00:30:57.100 two boroughs of New York City, Manhattan and the Bronx,

499 00:30:57.100 --> 00:31:01.590 and then we look at two counties in upstate New York,

500 00:31:01.590 --> 00:31:05.623 you would see that the NLDAS-2 model has a very,

501 00:31:07.140 --> 00:31:11.300 very shallow gradient of temperature and social

502 00:31:11.300 --> 00:31:15.960 vulnerability across these temperature predictions.

503 00:31:15.960 --> 00:31:18.060 However, with our XG boost model,

504 00:31:18.060 --> 00:31:22.530 because we reconstruct much more spatial heterogeneity,

505 00:31:22.530 --> 00:31:26.950 we see much more of a strong relationship

506 00:31:28.094 --> 00:31:31.323 with the social vulnerability index.

507 00:31:32.280 --> 00:31:36.280 So with the caveat that this is one hour of one day,

508 00:31:36.280 --> 00:31:39.810 what this implies to us is that there's potentially exposure

509 00:31:39.810 --> 00:31:43.800 misclassification in coarser models.

510 00:31:43.800 --> 00:31:48.380 And that that exposure misclassification may be differential

511 00:31:48.380 --> 00:31:50.453 by neighborhood vulnerability.

512 00:31:53.430 --> 00:31:55.870 So as a takeaway here,

513 00:31:55.870 --> 00:32:00.020 we've created highly accurate air temperature predictions

514 00:32:00.020 --> 00:32:03.120 that we think are right for application

515 00:32:03.120 --> 00:32:06.780 to social science, exposure science,

516 00:32:06.780 --> 00:32:09.203 and epidemiological studies.

517 00:32:11.040 --> 00:32:13.203 But wait, there's more,

518 00:32:13.203 --> 00:32:15.710 I think that this is a great segue

519 00:32:15.710 --> 00:32:19.240 because I'm currently expanding on these questions

520 00:32:19.240 --> 00:32:22.810 with work that I'm doing at the moment.

521 00:32:22.810 --> 00:32:26.670 And so right now, I want to quickly tell you about work

522 00:32:26.670 --> 00:32:30.900 that I have underway to try and explore these exposure

523 00:32:30.900 --> 00:32:35.900 disparities further and point to its potential importance

524 00:32:36.220 --> 00:32:39.030 for epidemiological methods.

525 00:32:39.030 --> 00:32:42.550 And so this is about thinking about residential segregation,

526 00:32:42.550 --> 00:32:46.193 air temperature, and circulatory mortality.

527 00:32:49.250 --> 00:32:51.360 So for the first part of the analysis,

528 00:32:51.360 --> 00:32:54.410 I'll be looking at exposure disparities,

529 00:32:54.410 --> 00:32:56.970 similar to the methods that I just showed you,

530 00:32:56.970 --> 00:32:59.730 but with some key differences.

531 00:32:59.730 --> 00:33:03.163 So unlike the last analysis,

532 00:33:03.163 --> 00:33:06.830 this time I actually want to look at the differences

533 00:33:06.830 --> 00:33:09.070 and the predictions by race.

534 00:33:09.070 --> 00:33:12.770 We know that we have suggestions from past literature

535 00:33:12.770 --> 00:33:16.120 that there are differences in exposure by race

536 00:33:16.120 --> 00:33:19.540 and ethnicity and so we want to look at this

537 00:33:19.540 --> 00:33:24.540 by race and ethnicity as well

538 00:33:24.550 --> 00:33:27.998 now that we have air temperature predictions.

539 00:33:27.998 --> 00:33:31.850 And so what we decided it had to do was we decided to

540 00:33:31.850 --> 00:33:35.090 aggregate our models to the census tract level

541 00:33:35.090 --> 00:33:39.770 like we did before and then we wanted to see what

542 00:33:39.770 --> 00:33:44.770 the differences were potentially in an experienced summer.

543 00:33:45.580 --> 00:33:49.840 And so what I did was I wanted to compare are the summertime

544 00:33:49.840 --> 00:33:54.050 aggregates so I borrowed from the energy literature

545 00:33:54.050 --> 00:33:57.560 and computed cooling degree days.

546 00:33:57.560 --> 00:34:00.540 So if you're unfamiliar with cooling degree days,

547 00:34:00.540 --> 00:34:04.160 generally speaking, what it is is measures

548 00:34:04.160 --> 00:34:08.480 of how much hotter a day is than a threshold value.

549 00:34:08.480 --> 00:34:11.500 Generally in the U.S., the threshold value that's used

550 00:34:11.500 --> 00:34:16.460 is 65 degrees Fahrenheit, or 18.3 degrees Celsius.

551 00:34:17.800 --> 00:34:21.810 So, as an example, if today is 67,

552 00:34:21.810 --> 00:34:25.750 which I wish that it were, but if it were 67 outside today,

553 00:34:25.750 --> 00:34:28.830 that would give us two cooling degree days.

554 00:34:28.830 --> 00:34:31.490 And then you repeat that for every other day,

555 00:34:31.490 --> 00:34:34.950 and then add up all of those cooling degree days

556 00:34:34.950 --> 00:34:37.293 for the summertime values.

557 00:34:38.610 --> 00:34:42.200 For now I'm only conducting a comparison

558 00:34:42.200 --> 00:34:46.470 of exposure experiences by black and white people,

559 00:34:46.470 --> 00:34:50.720 but in the future, I want to consider more racial groups

560 00:34:50.720 --> 00:34:55.307 to try and characterize these exposure disparities better.

561 00:34:56.880 --> 00:35:01.800 And you can imagine that if we see differences by race,

562 00:35:01.800 --> 00:35:05.680 someone could make an argument that it might be

563 00:35:05.680 --> 00:35:08.540 because different people live

564 00:35:08.540 --> 00:35:10.830 in different parts of the region.

565 00:35:10.830 --> 00:35:15.430 So for example, saying that more white folks live

566 00:35:15.430 --> 00:35:19.680 in the Northern most parts of the region like Maine

567 00:35:19.680 --> 00:35:22.100 and more black folks live in the Southern most part

568 00:35:22.100 --> 00:35:24.700 of the region like Virginia.

569 00:35:24.700 --> 00:35:29.700 And so we wanted to then make this within county comparison

570 00:35:30.850 --> 00:35:35.320 within geographic compact geographies,

571 00:35:35.320 --> 00:35:39.670 to look at exposure disparities within these

572 00:35:39.670 --> 00:35:42.730 more relevant administrative units.

573 00:35:42.730 --> 00:35:45.370 And so to address that,

574 00:35:45.370 --> 00:35:49.380 we then took a similar approach of comparing tracks

575 00:35:49.380 --> 00:35:52.790 within counties with our predictor variable,

576 00:35:52.790 --> 00:35:57.570 being the proportion of the census tract

577 00:35:57.570 --> 00:36:00.460 that was comprised of black folks,

578 00:36:00.460 --> 00:36:05.410 and then using random intercepts and slopes by county

579 00:36:05.410 --> 00:36:08.143 to then get county level comparisons.

580 00:36:11.240 --> 00:36:13.390 On the epidemiological side of things,

581 00:36:13.390 --> 00:36:16.100 you can imagine that getting health data that covers

582 00:36:16.100 --> 00:36:19.520 the entirety of this region is pretty difficult

583 00:36:19.520 --> 00:36:23.260 so we use it as an opportunity to get creative.

584 00:36:23.260 --> 00:36:26.990 We, again, access to CDC wonder data

585 00:36:26.990 --> 00:36:30.040 and although I'm interested in child health,

586 00:36:30.040 --> 00:36:33.890 CDC wonder data has some major limitations

587 00:36:33.890 --> 00:36:37.100 if we're thinking about a rarer health outcome

588 00:36:37.100 --> 00:36:38.523 like preterm birth.

589 00:36:40.390 --> 00:36:43.840 Data are provided are at very coarse geographies.

590 00:36:43.840 --> 00:36:48.210 In this case, data are only provided at the county level,

591 00:36:48.210 --> 00:36:51.900 and they're also only provided for course time spans.

592 00:36:51.900 --> 00:36:56.900 And then data that are counts that are below 10

593 00:36:57.700 --> 00:37:00.243 are suppressed for privacy concerns.

594 00:37:02.170 --> 00:37:06.923 So, because CVD mortality is a much more common event,

595 00:37:06.923 --> 00:37:11.923 we decided to conduct this analysis with CVD mortality.

596 00:37:12.202 --> 00:37:14.170 There are still however,

597 00:37:14.170 --> 00:37:17.880 a fair amount of suppressions of data

598 00:37:17.880 --> 00:37:19.410 and so to deal with that,

599 00:37:19.410 --> 00:37:23.590 we ended up using a left censored Poisson regression

600 00:37:23.590 --> 00:37:28.590 since there would be left censoring for lower counts.

601 00:37:28.900 --> 00:37:32.220 And really one of the things that I'm getting at here is

602 00:37:32.220 --> 00:37:37.000 around this question of exposure misclassification.

603 00:37:37.000 --> 00:37:40.010 So for example, in many environmental epidemiology studies,

604 00:37:40.010 --> 00:37:43.170 there's oftentimes an analysis that looks at effect

605 00:37:43.170 --> 00:37:47.150 modification by race, often finding higher effect estimates

606 00:37:47.150 --> 00:37:49.320 based on race and ethnicity.

607 00:37:49.320 --> 00:37:51.980 And while there are sometimes reasons to think that this

608 00:37:51.980 --> 00:37:55.545 might be the case, depending on exposure and context,

609 00:37:55.545 --> 00:38:00.530 I am often left wondering if it's potentially a consequence

610 00:38:00.530 --> 00:38:04.910 of underlying exposure disparities that our exposure models

611 00:38:04.910 --> 00:38:06.463 are not picking up.

612 00:38:07.670 --> 00:38:10.040 And so with that inspiration,

613 00:38:10.040 --> 00:38:13.503 I ended up doing four different regressions,

614 00:38:14.810 --> 00:38:19.640 two regressions for white folks using both exposure models

615 00:38:19.640 --> 00:38:23.350 and two regressions for black folks using both regression

616 00:38:23.350 --> 00:38:26.660 models or prediction models, I should say.

617 00:38:26.660 --> 00:38:29.170 And since this ended up being at the county level,

618 00:38:29.170 --> 00:38:32.870 I tried to preserve some of the exposure differences

619 00:38:32.870 --> 00:38:37.870 by computing weighted by track level racial composition,

620 00:38:38.820 --> 00:38:43.123 aggregated up to the county level.

621 00:38:46.670 --> 00:38:51.350 So these are preliminary results just for the year 2019.

622 00:38:52.970 --> 00:38:57.180 So this plot is simply looking at the distributions by race

623 00:38:57.180 --> 00:39:01.920 across the 13 states including DC.

624 00:39:01.920 --> 00:39:05.150 And what we see here is that actually both models

625 00:39:05.150 --> 00:39:09.470 appear to reconstruct a temperature disparity

626 00:39:09.470 --> 00:39:11.970 between whites and blacks.

627 00:39:11.970 --> 00:39:16.970 However, our XG boost model has a much more smoothed out

628 00:39:17.914 --> 00:39:22.493 distribution for black folks.

629 00:39:23.870 --> 00:39:28.190 And when we actually look at the median values experienced,

630 00:39:28.190 --> 00:39:31.830 we see that they're about the same for white folks,

631 00:39:31.830 --> 00:39:34.200 but between these two prediction models.

632 00:39:34.200 --> 00:39:38.470 But in fact, we have higher exposures for black folks

633 00:39:38.470 --> 00:39:40.283 with our XG boost model.

634 00:39:41.360 --> 00:39:44.080 But this is just looking across the entire region,

635 00:39:44.080 --> 00:39:47.370 this isn't actually of the results from our analysis

636 00:39:47.370 --> 00:39:49.580 and so from that linear mixed effect model

637 00:39:49.580 --> 00:39:51.580 that I mentioned earlier,

638 00:39:51.580 --> 00:39:56.410 we look to see at how these were related to the proportion

639 00:39:56.410 --> 00:40:00.420 of black people living inside of a census tract

640 00:40:00.420 --> 00:40:05.420 and we found that a zero to one increase for the proportion

641 00:40:06.170 --> 00:40:11.130 of folks was associated with 25 higher cooling degree days

642 00:40:11.130 --> 00:40:13.700 for the NLDS to model.

643 00:40:13.700 --> 00:40:15.820 But for the XG boost model,

644 00:40:15.820 --> 00:40:20.043 we reconstruct approximately 68 cooling degree days.

645 00:40:22.830 --> 00:40:26.990 And so we think that this is potentially important

646 00:40:26.990 --> 00:40:29.870 for reconstructing some of these potential

647 00:40:29.870 --> 00:40:33.540 exposure disparities and on the epidemiological

648 00:40:33.540 --> 00:40:37.890 side of things, when we do a stratified model

649 00:40:37.890 --> 00:40:41.900 for white folks, we see a modest but significant effect

650 00:40:41.900 --> 00:40:45.360 of approximately 1.04.

651 00:40:45.360 --> 00:40:47.880 But when we look at those as effect estimates

652 00:40:47.880 --> 00:40:52.760 for black folks, we see much higher effect estimates

653 00:40:52.760 --> 00:40:54.320 for both models.

654 00:40:54.320 --> 00:40:59.317 However, this is for the NLDAS-2 model with about 1.24

655 00:41:00.270 --> 00:41:01.783 as the effect estimate.

656 00:41:03.510 --> 00:41:04.670 It was mentioned in the slide

657 00:41:04.670 --> 00:41:06.580 but I should've said it before,

658 00:41:06.580 --> 00:41:11.170 these are scaled per 92 cooling degree days

659 00:41:11.170 --> 00:41:14.520 or one cooling degree day average increase

660 00:41:14.520 --> 00:41:15.883 across our time span.

661 00:41:18.198 --> 00:41:21.490 And so for the XG boost model,

662 00:41:21.490 --> 00:41:24.830 we see that we get a much lower,

663 00:41:24.830 --> 00:41:29.700 but still higher than for whites effect estimate of 1.14.

664 00:41:31.570 --> 00:41:34.220 So what this means to me,

665 00:41:34.220 --> 00:41:39.220 or implies to me that there is potentially exposure

666 00:41:39.270 --> 00:41:42.620 misclassification that can appear

667 00:41:43.840 --> 00:41:48.690 in epi models as greater susceptibility.

668 00:41:48.690 --> 00:41:51.610 And so I think that there is an opportunity here to think

669 00:41:51.610 --> 00:41:56.010 further about these models and what they can lend us

670 00:41:56.010 --> 00:41:59.103 for health disparities types of research.

671 00:42:01.690 --> 00:42:06.690 So some next steps here is that I have data for more years

672 00:42:06.780 --> 00:42:09.900 than just 2019, so I'm going to include more years

673 00:42:09.900 --> 00:42:11.680 in this analysis.

674 00:42:11.680 --> 00:42:15.810 We also know that there are exposure disparities

675 00:42:15.810 --> 00:42:19.650 for other forms of environmental contaminants

676 00:42:19.650 --> 00:42:22.610 like ozone or PM2.5.

677 00:42:22.610 --> 00:42:25.460 And so I want to potentially control for these

678 00:42:25.460 --> 00:42:28.571 as spatial temporal confounders,

679 00:42:28.571 --> 00:42:32.510 potentially contributing to these relationships.

680 00:42:32.510 --> 00:42:37.403 And then I want to include explicit measures of segregation.

681 00:42:38.420 --> 00:42:42.500 So, as I mentioned, I showed the proportion of black folks,

682 00:42:42.500 --> 00:42:46.270 but there's a whole host of literature that actually shows

683 00:42:46.270 --> 00:42:50.010 different measures of segregation like the dissimilarities

684 00:42:50.010 --> 00:42:53.750 index or the index of concentration at the extremes.

685 00:42:53.750 --> 00:42:55.540 And I would like to use these

686 00:42:55.540 --> 00:43:00.163 as potential predictors in these models.

687 00:43:01.850 --> 00:43:06.420 And then finally, I want to analyze these disparities

688 00:43:06.420 --> 00:43:09.200 in relation to energy data

689 00:43:09.200 --> 00:43:14.200 because I'm interested in studying some quantitative

690 00:43:14.750 --> 00:43:18.543 research between energy burden and energy insecurity,

691 00:43:19.550 --> 00:43:21.150 which leads me to some of my

692 00:43:21.150 --> 00:43:23.703 future directions and opportunities.

693 00:43:25.640 --> 00:43:28.700 So if you're unfamiliar with energy insecurity,

694 00:43:28.700 --> 00:43:33.230 this is a relatively new framework that my colleague

695 00:43:33.230 --> 00:43:38.230 Diana Hernandez at Columbia has used and described

696 00:43:39.650 --> 00:43:42.080 as a framework that outlines the interplay

697 00:43:42.080 --> 00:43:45.600 between energy needs, financial constraints,

698 00:43:45.600 --> 00:43:48.130 and behavioral adaptations.

699 00:43:48.130 --> 00:43:53.130 So I think a lot of us are familiar with this concept

700 00:43:53.524 --> 00:43:57.710 in what's referred to as the heat or eat dilemma.

701 00:43:57.710 --> 00:44:01.210 So the heat or eat dilemma describes the kind of precarious

702 00:44:01.210 --> 00:44:05.820 situation that historically poor families have been put in

703 00:44:05.820 --> 00:44:08.570 of during the winter time,

704 00:44:08.570 --> 00:44:13.570 do they keep themselves warm or do they forgo some staples,

705 00:44:14.440 --> 00:44:19.327 like a healthy meal, or perhaps they get their heating

706 00:44:20.670 --> 00:44:22.950 from some sort of precarious thing

707 00:44:22.950 --> 00:44:27.160 like opening their oven and putting a fan next to their oven

708 00:44:27.160 --> 00:44:29.373 to keep their home warm, right?

709 00:44:30.260 --> 00:44:33.233 We've heard the stories if not done it yourselves,

710 00:44:35.100 --> 00:44:36.930 but I think in a warming climate,

711 00:44:36.930 --> 00:44:40.783 we need to start having a conversation on analogous,

712 00:44:41.810 --> 00:44:45.770 what I'm coining the heat stroke or go broke dilemma.

713 00:44:45.770 --> 00:44:48.610 What does it mean to think about that

714 00:44:48.610 --> 00:44:53.400 there are folks who potentially have ACs in their homes,

715 00:44:53.400 --> 00:44:56.143 but can't afford to run those ACs.

716 00:44:57.930 --> 00:45:00.440 How do we think about that

717 00:45:00.440 --> 00:45:05.210 they may be foregoing other important staples of their lives

718 00:45:05.210 --> 00:45:09.400 on the other side of things to cool their homes.

719 00:45:09.400 --> 00:45:12.310 And so I think that there's a real opportunity

720 00:45:12.310 --> 00:45:16.430 for climate epidemiology and climate and health research

721 00:45:16.430 --> 00:45:18.883 to engage with some of this.

722 00:45:21.280 --> 00:45:25.160 And finally, I'm also interested in continuing to integrate

723 00:45:25.160 --> 00:45:28.590 the social and environmental determinants of health.

724 00:45:28.590 --> 00:45:32.920 So I didn't attend the society for epidemiologic research

725 00:45:32.920 --> 00:45:35.460 conference this year, but I saw on Twitter

726 00:45:35.460 --> 00:45:39.320 that one of the big takeaways was a quote from Jay Kaufman,

727 00:45:39.320 --> 00:45:43.830 who said that all epidemiology is social epidemiology.

728 00:45:43.830 --> 00:45:48.240 And I think that that lends a real opportunity for us

729 00:45:48.240 --> 00:45:53.240 to think about borrowing from the social epidemiology

730 00:45:53.610 --> 00:45:56.780 literature and also lending our tools

731 00:45:56.780 --> 00:45:59.670 to the social epidemiology literature.

732 00:45:59.670 --> 00:46:04.100 So we recently just published a paper

733 00:46:04.100 --> 00:46:05.950 in Nature Communications

734 00:46:05.950 --> 00:46:09.540 where we actually used environmental exposure

735 00:46:09.540 --> 00:46:12.270 mixtures methods that were designed

736 00:46:12.270 --> 00:46:15.300 for the environmental health sciences,

737 00:46:15.300 --> 00:46:18.010 and actually implied it to thinking about neighborhood

738 00:46:18.010 --> 00:46:21.980 disadvantage to try and understand some of the infection

739 00:46:21.980 --> 00:46:26.973 disparities that we're seeing in New York city for COVID-19.

740 00:46:27.970 --> 00:46:32.120 And so I think that there's an opportunity here to continue

741 00:46:32.120 --> 00:46:35.380 to, you know, trade and learn lessons

742 00:46:35.380 --> 00:46:39.273 across the different areas of public health.

743 00:46:40.800 --> 00:46:45.020 I'm also conducting a large natality analysis that I

744 00:46:45.020 --> 00:46:50.020 mentioned earlier in Mexico and soon hopefully accessing

745 00:46:51.040 --> 00:46:54.573 data for also New York state.

746 00:46:55.570 --> 00:47:00.180 And we're trying to apply mixtures methods in this context

747 00:47:00.180 --> 00:47:05.180 as well thinking about perinatal and climate epidemiology.

748 00:47:05.220 --> 00:47:07.270 I also want to continue to expand

749 00:47:07.270 --> 00:47:09.650 my own environmental justice lens.

750 00:47:09.650 --> 00:47:12.330 I think a lot of focus in environmental health

751 00:47:12.330 --> 00:47:15.560 has been on distributive justice,

752 00:47:15.560 --> 00:47:18.620 but what does it mean to also think about different forms

753 00:47:18.620 --> 00:47:20.130 of environmental justice,

754 00:47:20.130 --> 00:47:23.750 like procedural justice or restorative justice

755 00:47:23.750 --> 00:47:25.780 in these contexts?

756 00:47:25.780 --> 00:47:29.040 And then finally, I'm hoping to get more engaged

757 00:47:29.040 --> 00:47:32.520 in community and policy engaged research to try and find

758 00:47:32.520 --> 00:47:37.130 climate energy and health leverage points that we can use

759 00:47:37.130 --> 00:47:40.030 to create a more health equitable

760 00:47:40.030 --> 00:47:42.013 and climate equitable future.

761 00:47:43.800 --> 00:47:48.770 So of course this research relies on a ton of folks to help

762 00:47:48.770 --> 00:47:52.210 make this possible, so thank you to all of those folks,

763 00:47:52.210 --> 00:47:55.693 as well as the funding that has made this all possible.

764 00:47:57.500 --> 00:47:59.933 And with that, I will open up for questions.

765 00:48:04.750 --> 00:48:08.950 <v ->So, yeah, thank you, Daniel, for a very well-presented</v>

766 00:48:08.950 --> 00:48:10.093 and interesting talk.

767 00:48:12.770 --> 00:48:15.020 I could start with a question.

768 00:48:15.020 --> 00:48:18.260 Well, maybe other people are thinking about theirs,

769 00:48:18.260 --> 00:48:23.260 so you spoke a lot about temperature exposure disparities

770 00:48:28.620 --> 00:48:32.140 and then introduced how energy,

771 00:48:32.140 --> 00:48:35.530 so you have the temperature exposure disparities,

772 00:48:35.530 --> 00:48:37.280 and then on top of that,

773 00:48:37.280 --> 00:48:41.970 you have the people with the highest temperature exposure

774 00:48:41.970 --> 00:48:45.950 having less of an ability to deal with that high temperature

775 00:48:45.950 --> 00:48:50.700 exposure and that part you didn't address as much,

776 00:48:50.700 --> 00:48:53.700 you know, understand that you can only do so much,

777 00:48:53.700 --> 00:48:55.680 but I'm wondering, you know,

778 00:48:55.680 --> 00:49:00.680 have you thought about ways to measure that,

779 00:49:01.338 --> 00:49:05.980 let's call it energy insecurity in epidemiologic studies

780 00:49:05.980 --> 00:49:08.133 in order to make that next step?

781 00:49:09.860 --> 00:49:10.860 <v ->Yeah, absolutely.</v>

782 00:49:10.860 --> 00:49:15.380 So I'm interested in this in two different ways.

783 00:49:15.380 --> 00:49:20.380 So I think that we could do work to actually collect data

784 00:49:20.800 --> 00:49:24.440 from folks to try and get a better sense,

785 00:49:24.440 --> 00:49:29.440 a better quantitative sense of people's energy insecurity.

786 00:49:30.670 --> 00:49:35.097 So Diana has developed actually an energy insecurity

787 00:49:36.570 --> 00:49:41.570 screening tool and so it would be great to try

788 00:49:41.950 --> 00:49:44.240 and get that screening tool out there

789 00:49:44.240 --> 00:49:48.210 as part of larger studies so that we can understand

790 00:49:48.210 --> 00:49:50.960 the kind of geographic distribution

791 00:49:50.960 --> 00:49:55.170 of this energy insecurity and trying to overlay that

792 00:49:55.170 --> 00:49:58.660 potentially with what we know about temperature.

793 00:49:58.660 --> 00:50:00.130 So that's on one end.

794 00:50:00.130 --> 00:50:05.130 On the other end, I think the lower hanging fruit

795 00:50:07.440 --> 00:50:10.320 is actually to access energy data.

796 00:50:10.320 --> 00:50:13.760 And so this is something that we're working on right now

797 00:50:13.760 --> 00:50:18.760 actually is to use energy data and pair that with

798 00:50:19.470 --> 00:50:23.220 our temperature predictions to see if we could see

799 00:50:23.220 --> 00:50:27.680 differences in the dose response relationship

800 00:50:27.680 --> 00:50:30.540 between neighborhood temperature

801 00:50:30.540 --> 00:50:34.250 and energy utilization by neighborhood.

802 00:50:34.250 --> 00:50:37.050 And if we see differences in the slopes

803 00:50:37.050 --> 00:50:39.460 between those neighborhoods,

804 00:50:39.460 --> 00:50:42.860 then that would imply to me that potentially

805 00:50:42.860 --> 00:50:45.590 those are differences in your response

806 00:50:45.590 --> 00:50:50.590 to the temperature and your ability to keep yourself cool.

807 00:50:50.810 --> 00:50:52.320 Of course, that needs to be adjusted

808 00:50:52.320 --> 00:50:54.918 for many, many different things,

809 00:50:54.918 --> 00:50:59.918 but that is where I'm thinking as a lower hanging fruit

810 00:51:00.260 --> 00:51:02.733 using administrative data at the moment.

811 00:51:04.200 --> 00:51:08.073 <v ->Great, other questions, comments?</v>

812 00:51:10.180 --> 00:51:13.090 <v ->I have a question or a comment and observation,</v>

813 00:51:13.090 --> 00:51:15.690 first of all, this is an amazing presentation.

814 00:51:15.690 --> 00:51:18.720 It's brilliant work, and it could not be more timely.

815 00:51:18.720 --> 00:51:22.510 And I'm going to go to your last point, talking about,

816 00:51:22.510 --> 00:51:25.650 you know, the application of your work and of this research

817 00:51:25.650 --> 00:51:29.080 within the current policy development work

818 00:51:29.080 --> 00:51:30.990 at the federal level right now.

819 00:51:30.990 --> 00:51:33.800 And I think that you're diving in and focusing in

820 00:51:33.800 --> 00:51:36.020 on that exposure data and how

821 00:51:36.020 --> 00:51:39.280 we're not getting an accurate indication of what

822 00:51:39.280 --> 00:51:42.330 the risk are is vitally important

823 00:51:42.330 --> 00:51:44.490 and there are a couple of proceedings right now, you know,

824 00:51:44.490 --> 00:51:47.820 with the executive order 13895,

825 00:51:47.820 --> 00:51:50.380 with executive order 14009.

826 00:51:50.380 --> 00:51:54.230 There's an OMB, a docket open until July six.

827 00:51:54.230 --> 00:51:58.180 There's another FEMA docket open until July 21st,

828 00:51:58.180 --> 00:52:02.490 is how are you, whether you are planning

829 00:52:02.490 --> 00:52:04.520 or whether you could consider

830 00:52:04.520 --> 00:52:07.350 taking your research and getting it into these

831 00:52:07.350 --> 00:52:10.090 and other dockets because that is setting

832 00:52:10.090 --> 00:52:14.050 the administrative record where we can start changing how

833 00:52:14.050 --> 00:52:16.990 the federal government is thinking about this.

834 00:52:16.990 --> 00:52:21.380 So I don't know what your thoughts are in trying to move

835 00:52:21.380 --> 00:52:23.420 in those spaces.

836 00:52:23.420 --> 00:52:25.376 <v ->Yeah, no, absolutely.</v>

837 00:52:25.376 --> 00:52:29.690 And I would definitely look to others who are closer

838 00:52:29.690 --> 00:52:34.150 to the policy landscape to help me figure out

839 00:52:34.150 --> 00:52:36.430 what the leverage points are.

840 00:52:36.430 --> 00:52:41.040 The most proximal leverage point that I'm aware of

841 00:52:41.040 --> 00:52:43.710 is actually what environmental justice folks

842 00:52:43.710 --> 00:52:45.750 are talking about right now.

843 00:52:45.750 --> 00:52:50.560 Folks that We Act are talking about that the low income home

844 00:52:50.560 --> 00:52:55.560 energy assistance program has been historically used for

845 00:52:55.958 --> 00:53:00.958 helping to keep folks warm during the winter,

846 00:53:00.960 --> 00:53:05.630 but has been lesser so used to help keep folks cool

847 00:53:05.630 --> 00:53:07.410 during the summer.

848 00:53:07.410 --> 00:53:11.850 And so we already have a policy instrument in place

849 00:53:11.850 --> 00:53:15.080 to identify the people who need the help,

850 00:53:15.080 --> 00:53:20.080 but we don't have the dollars allocated to the right part,

851 00:53:20.341 --> 00:53:24.980 potentially the right part of the exposure distribution.

852 00:53:24.980 --> 00:53:29.813 And so I think that that is the most proximal policy

853 00:53:29.813 --> 00:53:34.010 instrument that I'm aware of that could help move the needle

854 00:53:34.010 --> 00:53:36.403 towards improving public health.

855 00:53:38.380 --> 00:53:39.660 <v ->That's fantastic.</v>

856 00:53:39.660 --> 00:53:41.670 You know I would also throw out taking that

857 00:53:41.670 --> 00:53:44.320 as that illustration applying the national environmental

858 00:53:44.320 --> 00:53:46.640 policy act and the resurgence and undoing

859 00:53:46.640 --> 00:53:48.630 what the Trump administration did to that law

860 00:53:48.630 --> 00:53:51.380 because I think there's some opportunities for programmatic

861 00:53:51.380 --> 00:53:54.476 environmental impact statement reviews

862 00:53:54.476 --> 00:53:57.110 and it would be great to get your data, you know,

863 00:53:57.110 --> 00:53:59.500 forming the basis of some of those types of actions.

864 00:53:59.500 --> 00:54:00.760 So thank you.

865 00:54:00.760 --> 00:54:01.660 <v ->Yeah, thank you.</v>

866 00:54:03.630 --> 00:54:05.363 <v ->Other questions or comments?</v>

867 00:54:12.960 --> 00:54:15.830 <v ->Maybe just a small technical question.</v>

868 00:54:15.830 --> 00:54:18.350 We know that using CDC wonder data

869 00:54:18.350 --> 00:54:21.790 for especially the birth outcome,

870 00:54:21.790 --> 00:54:26.200 this issue is you mentioned briefly that the temporary

871 00:54:26.200 --> 00:54:28.410 resolution is not good enough.

872 00:54:28.410 --> 00:54:31.520 They don't accurate give you the exact date.

873 00:54:31.520 --> 00:54:33.820 So I'm wondering how do you deal with

874 00:54:33.820 --> 00:54:36.183 in your time cross data with that?

875 00:54:38.510 --> 00:54:39.470 <v ->Oh yeah, for sure.</v>

876 00:54:39.470 --> 00:54:44.470 So we ended up doing a lot of interpolation estimates.

877 00:54:47.430 --> 00:54:52.430 So for example CDC wonder can give you how many births

878 00:54:52.810 --> 00:54:55.230 there on it are in a day of the week,

879 00:54:55.230 --> 00:54:57.420 in a typical day of the week.

880 00:54:57.420 --> 00:55:00.270 And it'll give you how many births there were in a month.

881 00:55:00.270 --> 00:55:05.120 And so we ended up then doing a lot of averaging.

882 00:55:05.120 --> 00:55:09.090 Knowing Tuesdays, let's say are where, you know,

883 00:55:09.090 --> 00:55:11.350 30% of the births are happening,

884 00:55:11.350 --> 00:55:14.970 20% are happening on Wednesdays, let's say.

885 00:55:14.970 --> 00:55:19.970 Using that relationship, again with the longer month

886 00:55:20.890 --> 00:55:25.430 time span to then do a lot of smoothing and averaging

887 00:55:25.430 --> 00:55:28.320 to get an estimate of how many births there were.

888 00:55:28.320 --> 00:55:30.040 I don't think for this study

889 00:55:30.040 --> 00:55:32.770 we need an actual accurate number

890 00:55:32.770 --> 00:55:37.512 of births because at the end of the day,

891 00:55:37.512 --> 00:55:42.512 you're creating your truth with the simulation methods.

892 00:55:44.230 --> 00:55:47.570 But it's just a way of making sure that we have good

893 00:55:47.570 --> 00:55:52.060 representation of the different age groupings

894 00:55:52.060 --> 00:55:54.750 of different preterm births.

895 00:55:54.750 --> 00:55:59.750 Are there more 20 week olds perhaps being born in February

896 00:56:00.720 --> 00:56:03.740 rather than in June, right?

897 00:56:03.740 --> 00:56:07.048 Trying to preserve some of those distributions

898 00:56:07.048 --> 00:56:11.730 of the different weeks of gestation

899 00:56:11.730 --> 00:56:13.830 was where we spent a lot of our attention.

900 00:56:15.840 --> 00:56:17.990 <v ->Thanks yeah, that's makes a lot of sense.</v>

901 00:56:18.825 --> 00:56:21.290 And I'm more thinking of like a new addition

902 00:56:22.237 --> 00:56:24.560 to your similar study in the future, your future work,

903 00:56:24.560 --> 00:56:27.090 if you want to extend to the whole U.S.

904 00:56:27.090 --> 00:56:31.010 that might be something to be carefully dealt with.

905 00:56:33.000 --> 00:56:33.950 <v ->Yeah, absolutely.</v>

906 00:56:36.129 --> 00:56:38.083 <v ->So I, there's a question in the chat.</v>

907 00:56:38.083 --> 00:56:39.760 I think this'll be the last question.

908 00:56:39.760 --> 00:56:42.380 It's from Taiwo Bello,

909 00:56:42.380 --> 00:56:46.580 Please, how convinced are you about these studies

910 00:56:46.580 --> 00:56:50.460 considering that Africa has the hottest temperature

911 00:56:50.460 --> 00:56:54.190 and majority had no cooling systems in place

912 00:56:54.190 --> 00:56:57.370 and what are the limitations of your research findings?

913 00:56:57.370 --> 00:56:58.203 Thank you.

914 00:56:59.610 --> 00:57:00.570 <v ->Yeah, absolutely.</v>

915 00:57:00.570 --> 00:57:05.186 So I think the temperature epidemiology

916 00:57:05.186 --> 00:57:07.980 generally shows that there is such a thing

917 00:57:07.980 --> 00:57:11.370 as acclimatization, that there are differences

918 00:57:11.370 --> 00:57:13.960 in people's response to different temperatures

919 00:57:13.960 --> 00:57:16.500 in different parts of the world based on what

920 00:57:16.500 --> 00:57:18.983 they're historically exposed to.

921 00:57:20.190 --> 00:57:23.570 And so to some degree,

922 00:57:23.570 --> 00:57:28.139 people are climatized to the places that they live in.

923 00:57:28.139 --> 00:57:33.139 Another factor that needs to be considered as well is that

924 00:57:33.516 --> 00:57:37.370 humidity is also very different in different parts

925 00:57:37.370 --> 00:57:38.310 of the world.

926 00:57:38.310 --> 00:57:41.927 So in Western Africa, for example,

927 00:57:41.927 --> 00:57:44.370 at least the places that I've done research,

928 00:57:44.370 --> 00:57:47.030 humidity is not as high

929 00:57:47.030 --> 00:57:51.720 as it is in the Caribbean, let's say,

930 00:57:51.720 --> 00:57:53.620 or in other parts of the world, right?

931 00:57:53.620 --> 00:57:57.460 And so humidity plays a big part in our ability

932 00:57:57.460 --> 00:58:01.100 to thermo regulate in our ability to dissipate heat.

933 00:58:01.100 --> 00:58:04.800 And so I think that that's an important part of this

934 00:58:04.800 --> 00:58:07.950 relationship that a lot of temperature epidemiology

935 00:58:07.950 --> 00:58:12.410 kind of grapples with to do this.

936 00:58:12.410 --> 00:58:16.747 And I think the last thing I should mention is I think

937 00:58:17.800 --> 00:58:20.980 that we don't have sufficient evidence in many parts

938 00:58:20.980 --> 00:58:25.620 of the world to necessarily say that that heat

939 00:58:25.620 --> 00:58:28.830 is not an issue in Africa.

940 00:58:28.830 --> 00:58:33.100 There are studies that show that heat is an issue in Africa,

941 00:58:33.100 --> 00:58:35.530 even though the dose response relationships

942 00:58:35.530 --> 00:58:39.460 may be different, but nonetheless people

943 00:58:39.460 --> 00:58:44.460 are impacted by heat in Sub-Saharan Africa as well

944 00:58:44.590 --> 00:58:49.360 and I think it's actually a call for more research

945 00:58:49.360 --> 00:58:51.800 in the region to understand

946 00:58:51.800 --> 00:58:54.533 what those relationships look like.

947 00:58:56.710 --> 00:59:00.230 <v ->Okay, so thank you very much, Daniel.</v>

948 00:59:00.230 --> 00:59:04.120 You gave a very interesting talk and congratulations

949 00:59:04.120 --> 00:59:06.100 on doing such great work.

950 00:59:06.100 --> 00:59:07.530 <v ->Thank you so much.</v>

951 00:59:07.530 --> 00:59:09.053 <v ->Okay, take care, everyone.</v>