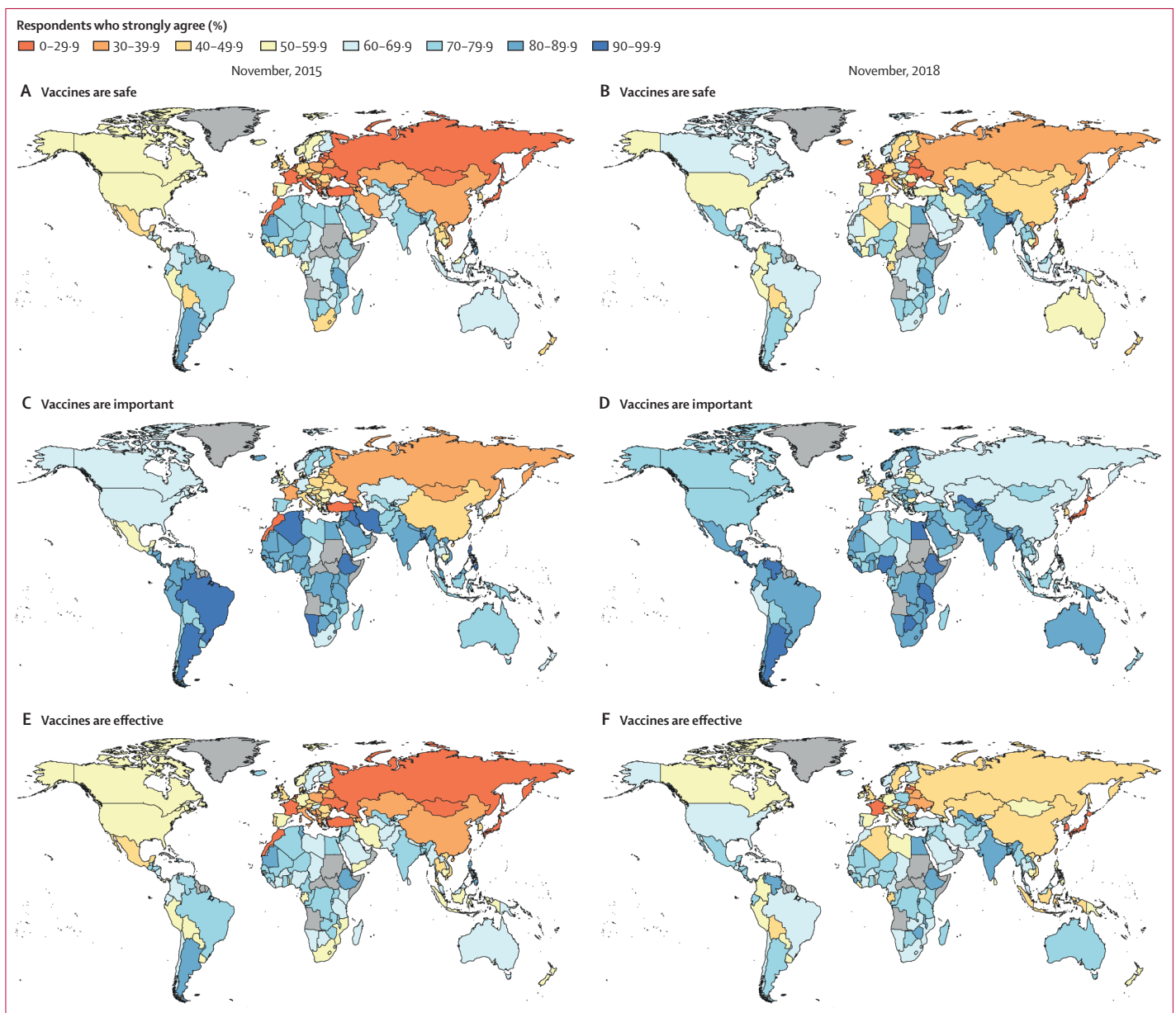


by sex and age according to national distributions, with equal sex representation in most surveys (appendix 2).

**Model-based estimates of vaccine confidence**

The proportion of respondents falling into each of the three response categories (“strongly agree”, “strongly disagree”, and “neither strongly agree nor strongly disagree”) for each confidence statement and in each country at any given timepoint was modelled as multinomial logit Gaussian process model.<sup>29</sup> Model inference

was done using Gibbs sampling and 10000 samples (or draws) were obtained from the posterior predictive distributions, from which mean estimates were calculated (see appendix 1 pp 5–7 for full model details). Model performance was assessed using out-of-sample validation using five-fold cross-validation. Out-of-sample metrics indicated good model fit with a mean error of  $10^{-17}$ , mean absolute error of  $10 \cdot 10$ , and a root mean square error of  $15 \cdot 29$ . Our model was used to estimate vaccine confidence across all surveyed countries at two timepoints (November, 2015, and November, 2018) when many



**Figure 1: Global trends in perceptions towards the safety of vaccines in November, 2015, and November, 2018**

Figure shows model-based estimates of the percentage of respondents strongly agreeing that vaccines are safe (panels A, B), important for children to have (panels C, D), and effective (panels E, F) in November, 2015, and November, 2018. No data were available for countries in grey.