Modelling 2020 overall mortality

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TAG Working Group I

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Data

- Sources for overall deaths:

Source	# of populations	2020 Total # deaths	2020 Mean # of age-groups
WHO	13	6.6	19
STMF	27	4.6	18
Statistical bureaus	7	4.0	78
Eurostat	9	1.3	19
UN PD	11	0.5	20
Totals	67	6.6	25

- Criteria for selecting sources/year:
  - 2020 must be available
  - 2015-2019 when coming from the same source
  - prioritize source coherence with respect to longer periods
  - preference for more detailed age-groups
- Sources for the exposures: UN WPP (single year of age)
- Age-range: 0-100
- Sexes combined

Model

- For each population over age x, we have two mortality patterns:
  - $\eta^1(x)$ for the overall pre-pandemic years (sum up data < 2020)
  - $\eta^2(x)$ for 2020
- We model data in 2020 as follows:

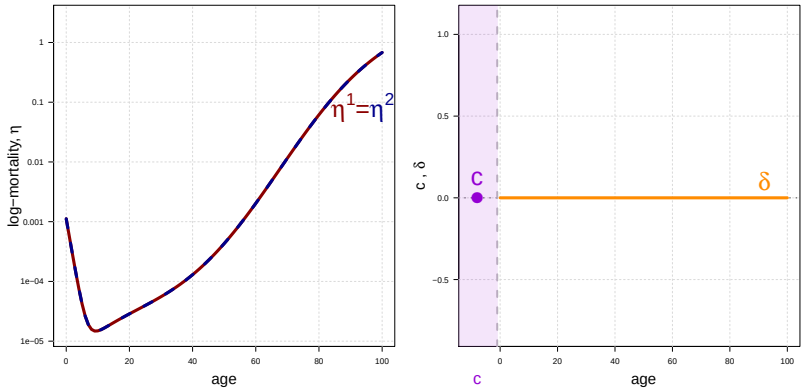
$$\eta^2(x) = \eta^1(x) + c + \delta(x)$$

  - c scaling factor
  - $\delta(x)$ age-dependent adjustment component ($\sum \delta(x) = 0$)
- Both $\eta^1(x)$ and $\delta(x)$ are assumed to be smooth
- The model is multiplicative at the force of mortality level:

$$e^{\eta^2(x)} = \mu^2(x) = e^{\eta^1(x)}\, e^c\, e^{\delta(x)} = \mu^1(x)\, e^c\, e^{\delta(x)}$$

  - both e^c and $e^{\delta(x)}$ can be interpreted as relative risk factors

A schematic illustration



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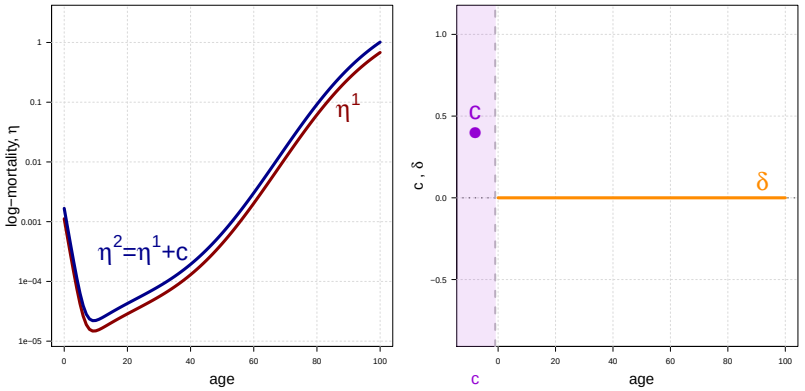

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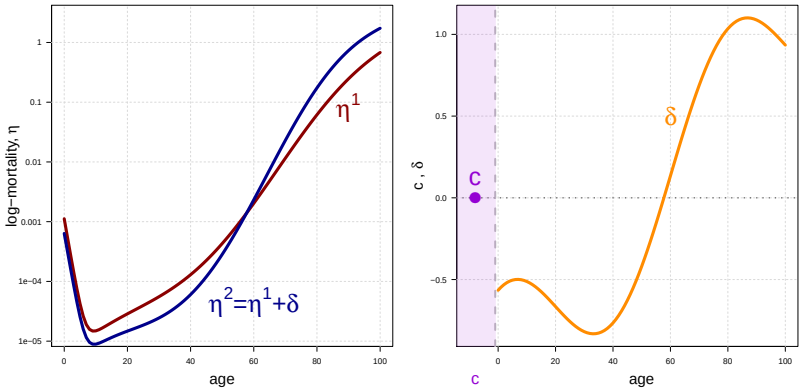

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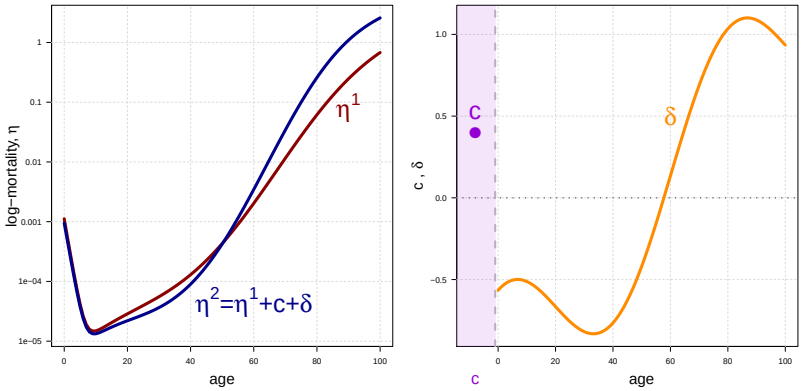
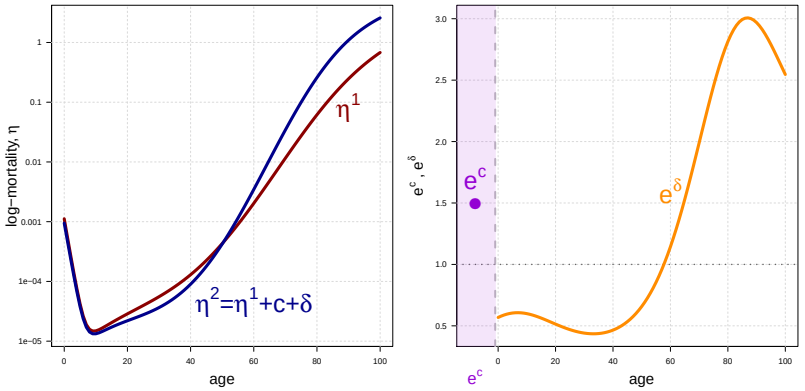
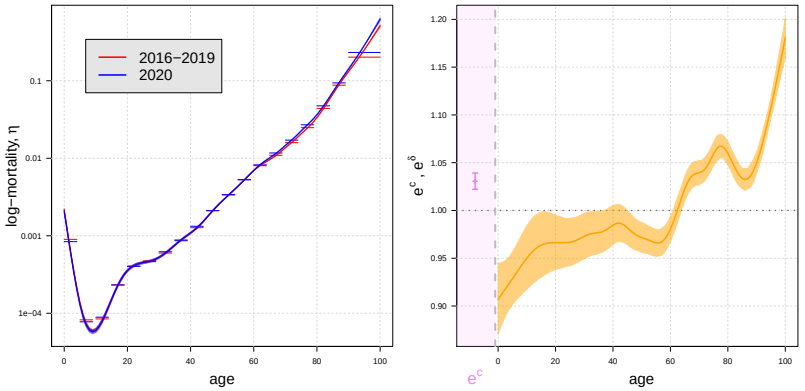


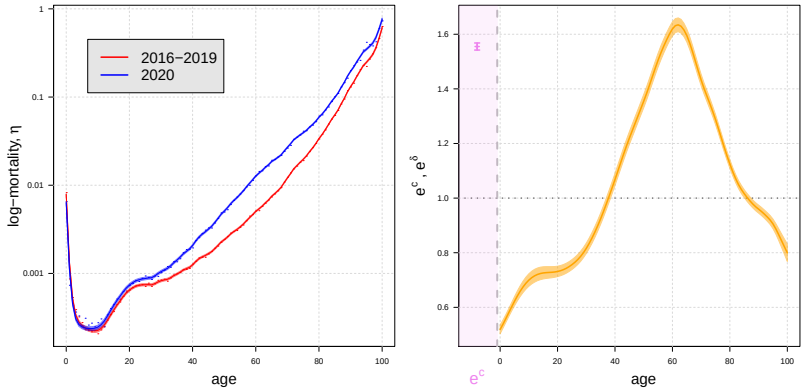
A schematic illustration: a relative risk perspective



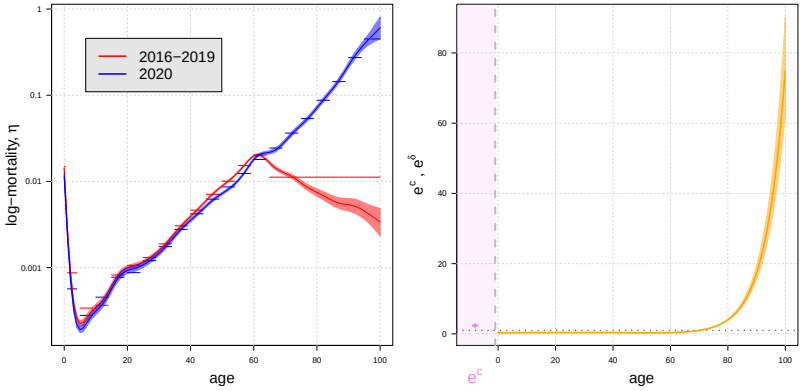
Actual data illustration 1: France (mainly old ages)



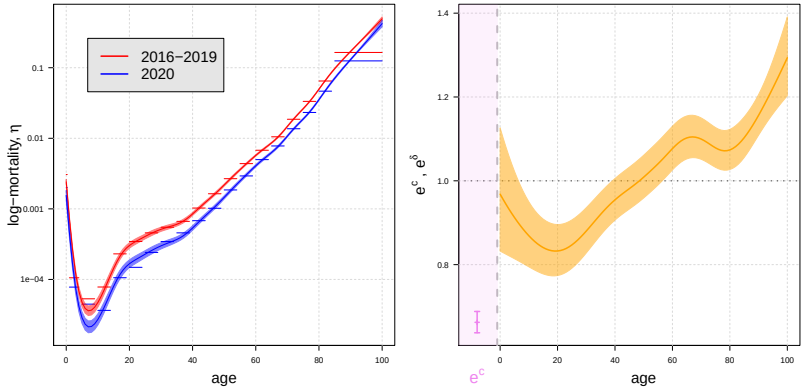
Actual data illustration 2: Peru (middle-age hump)



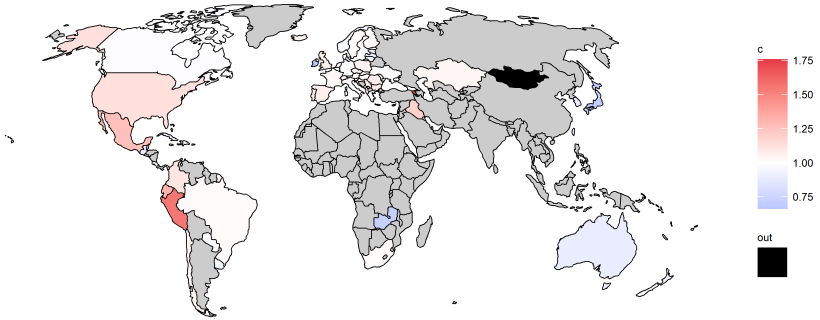
Actual data illustration 3: Mongolia (clear data issues)



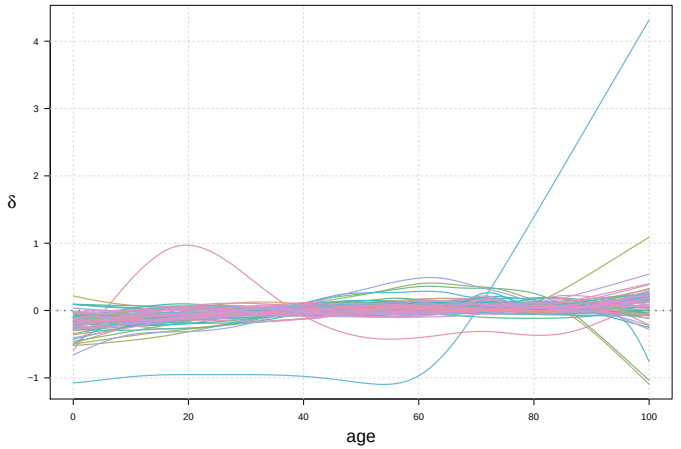
Actual data illustration 4: Ireland (a good 2020?)



World Map with e^c (relative risk scaling factor)

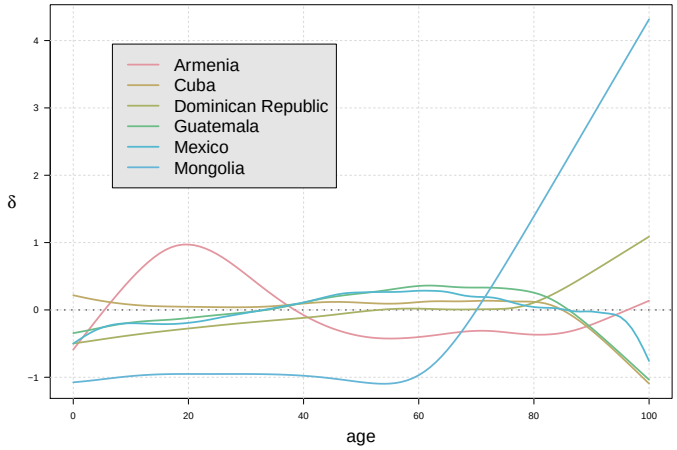


Age-dependent component $\delta(x)$



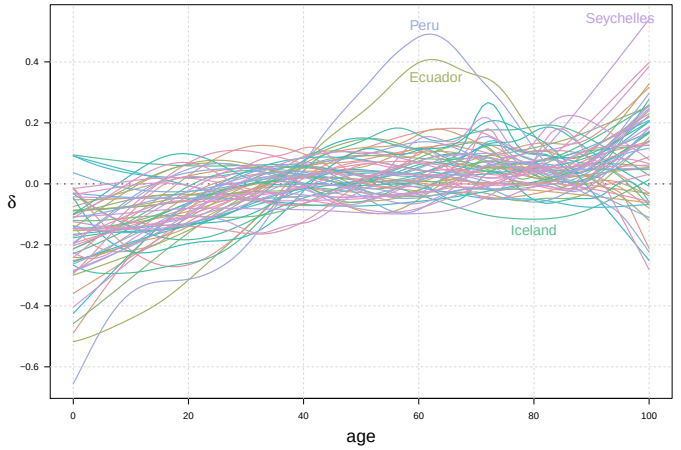
Parameter δ for all available data

Age-dependent component $\delta(x)$



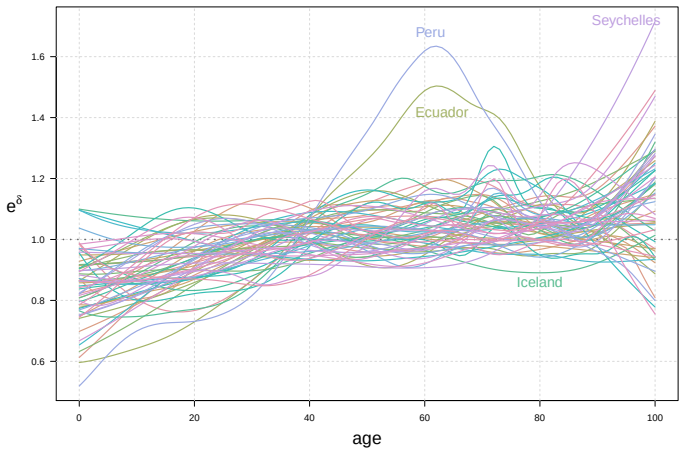
Parameter δ for populations with clear data issue or peculiar patterns

Age-dependent component $\delta(x)$



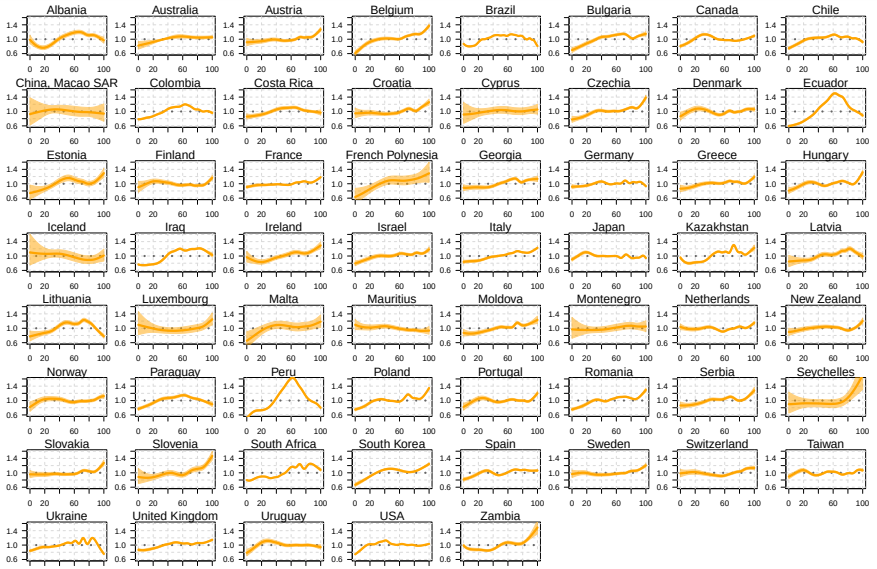
Parameter δ for populations without clear data issue or peculiar patterns

Age-dependent component $e^{\delta(x)}$

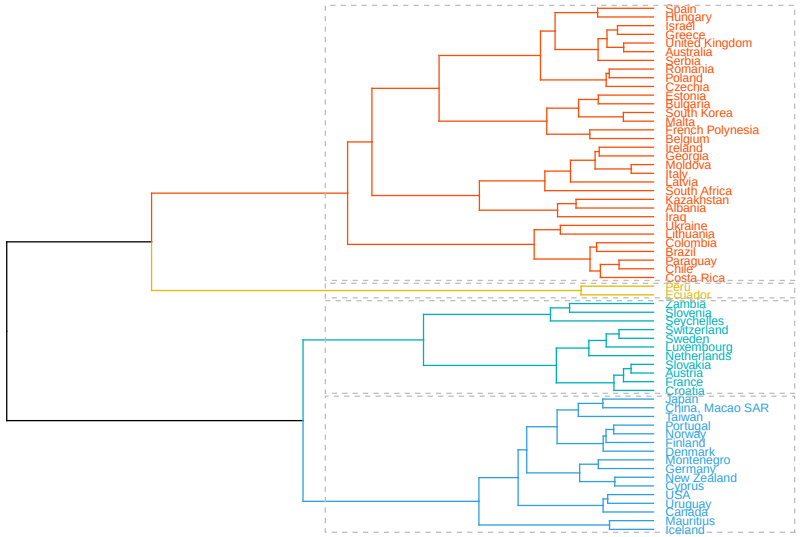


Parameter e^{δ} for populations without clear data issue or peculiar patterns

Age-dependent component $e^{\delta(x)}$



An attempt to cluster $\delta(x)$



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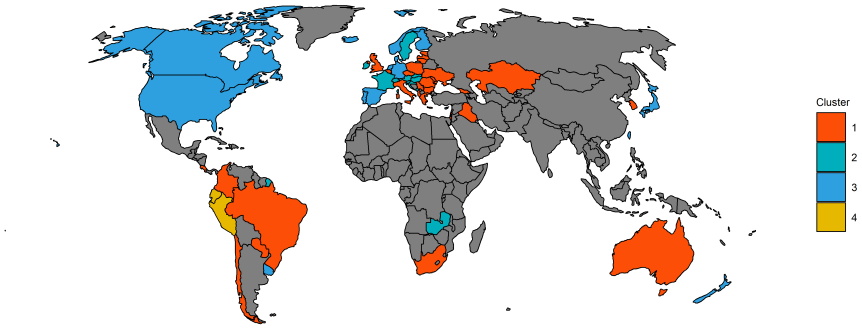

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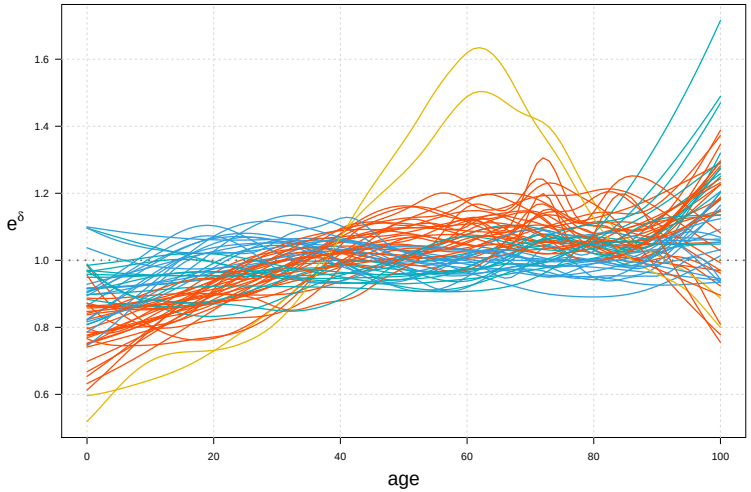

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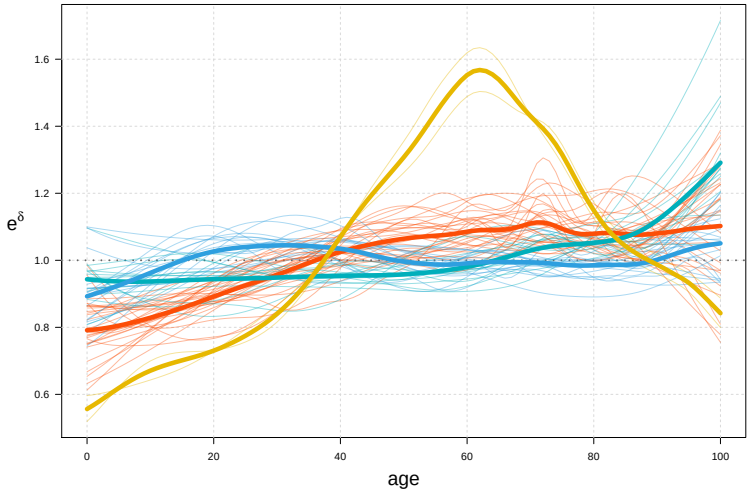
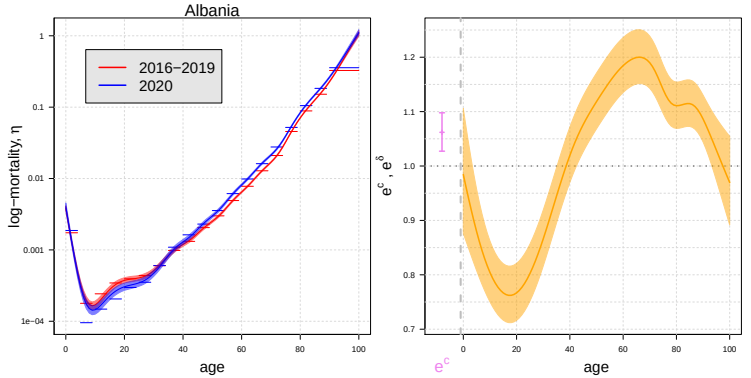


All populations



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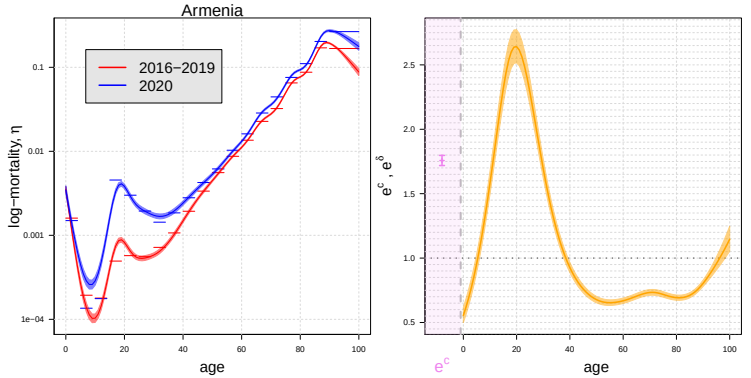

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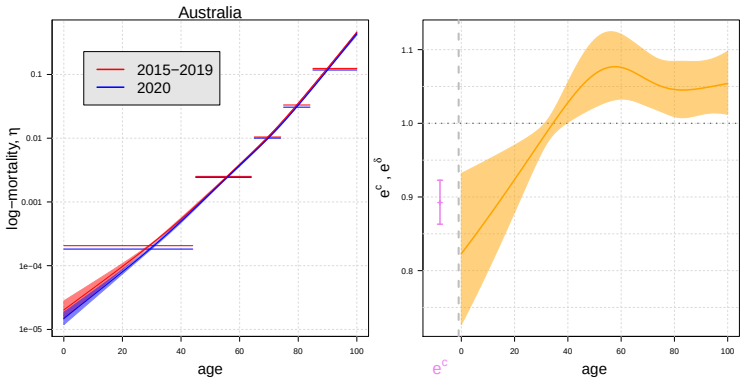

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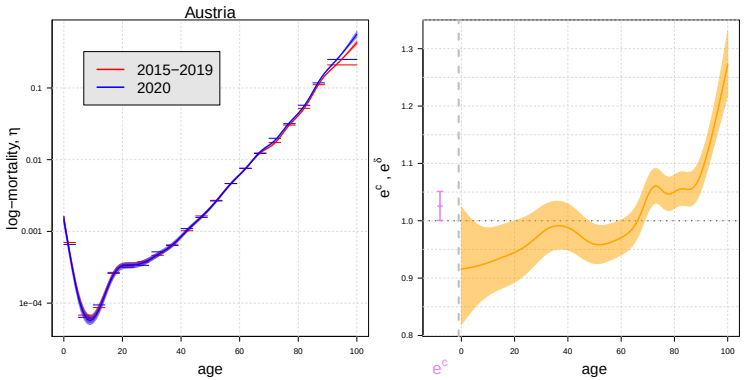

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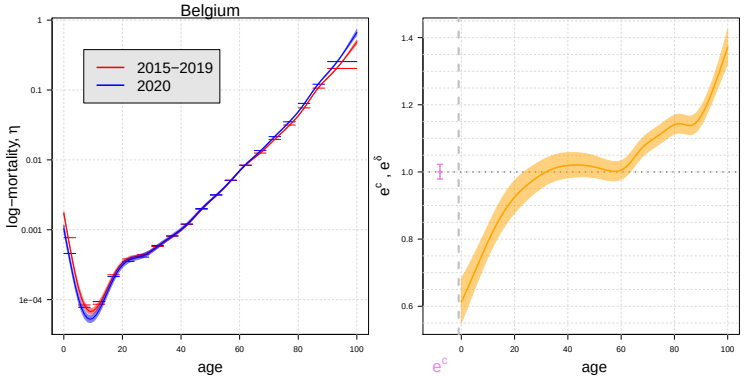

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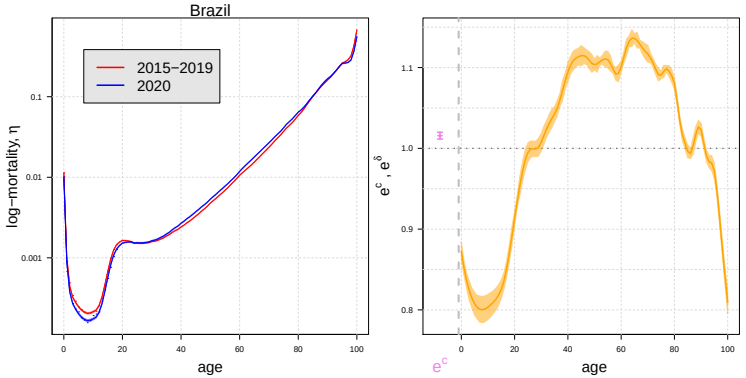

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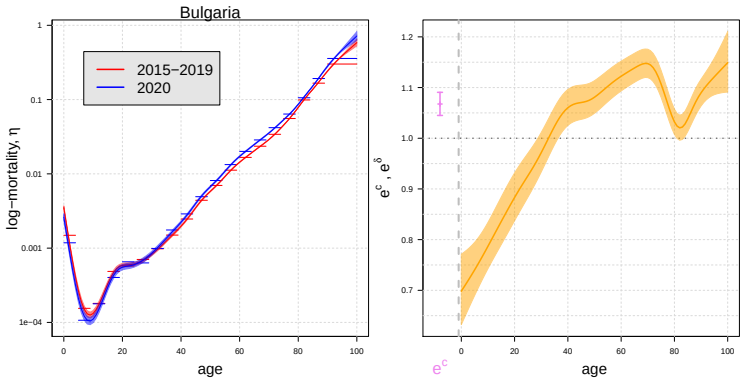

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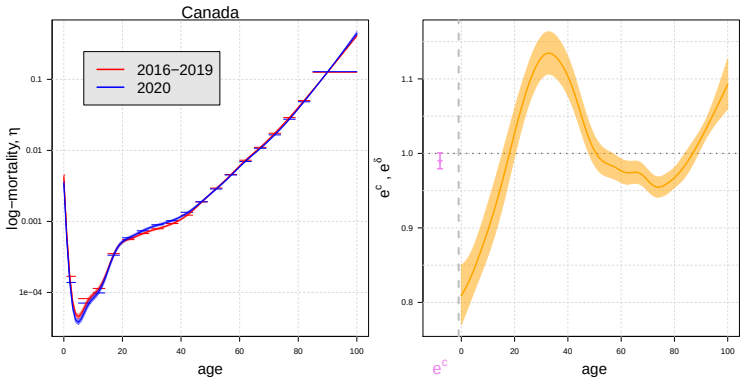

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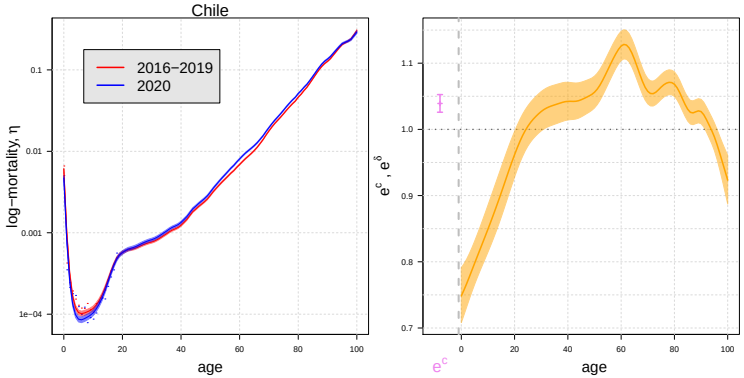

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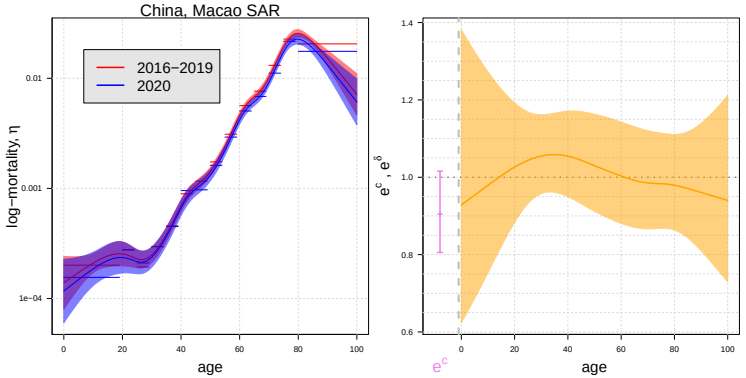

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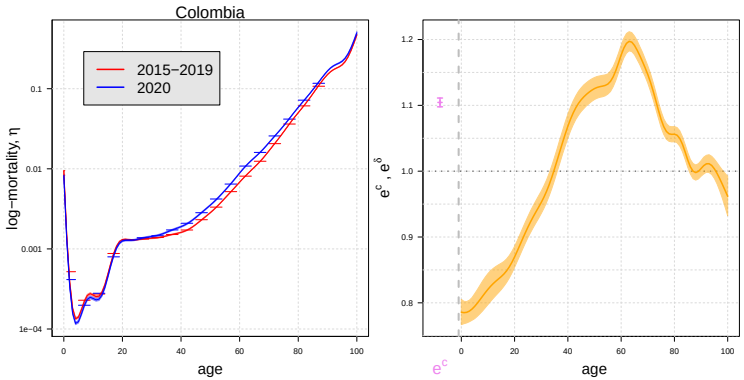

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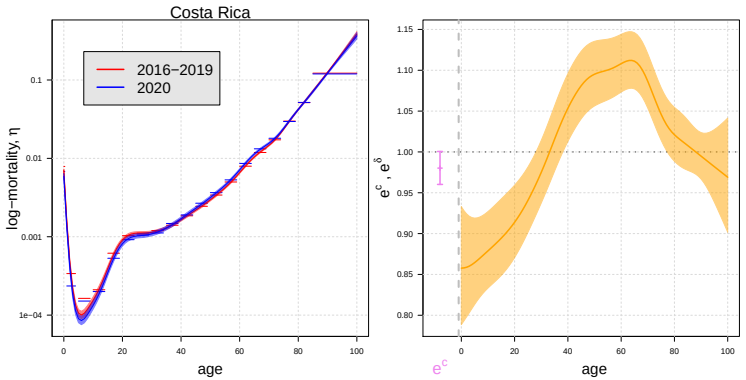

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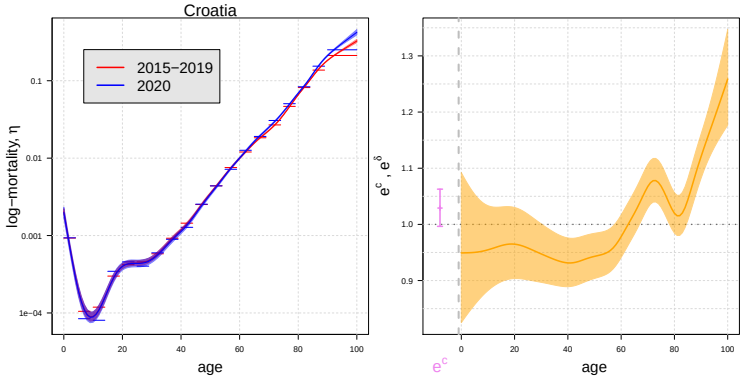

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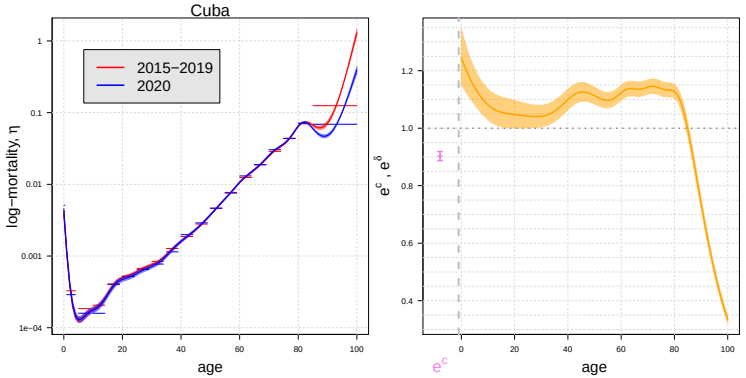

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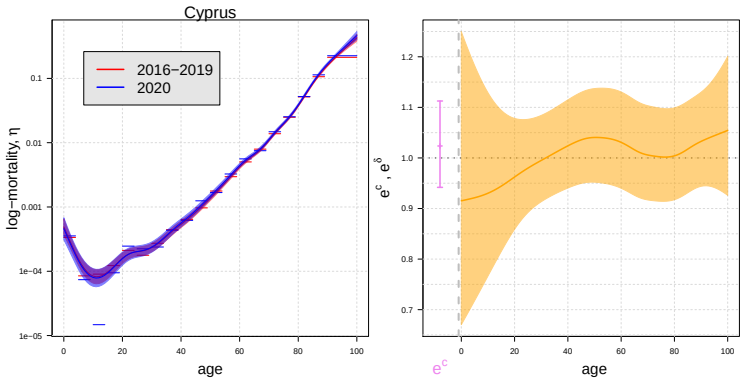

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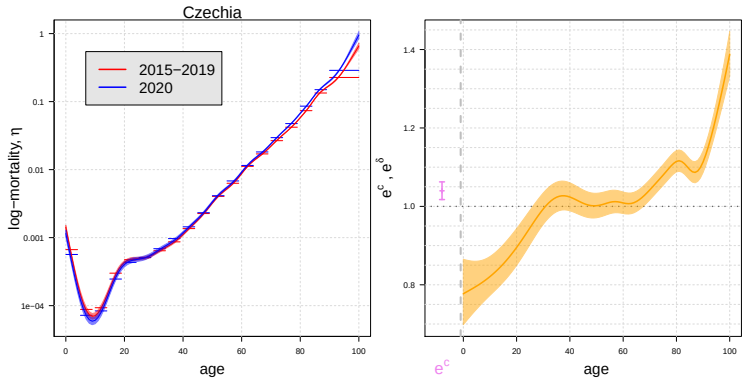

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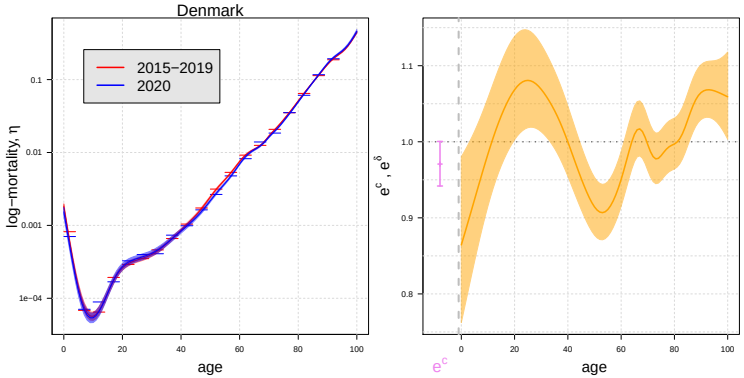

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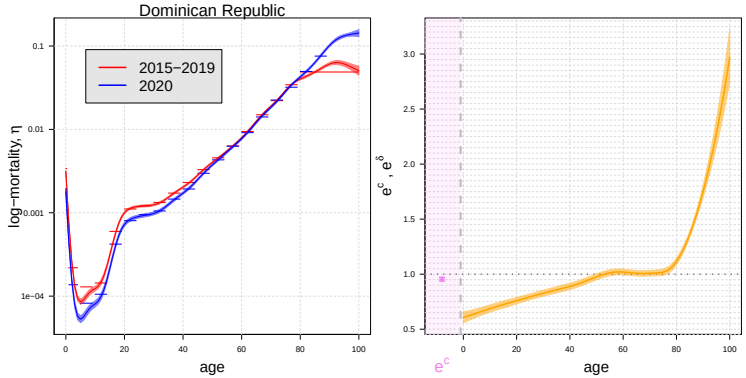

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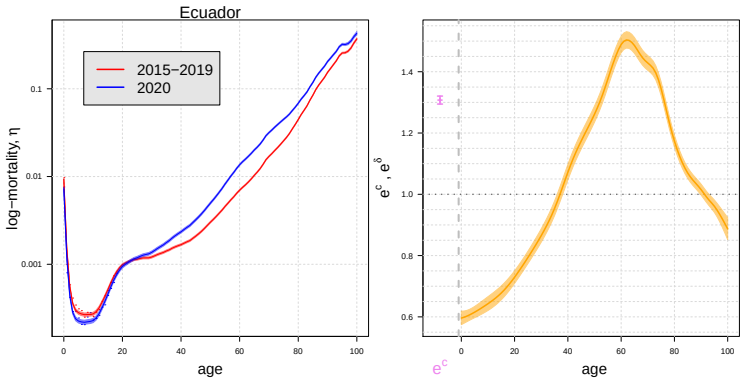

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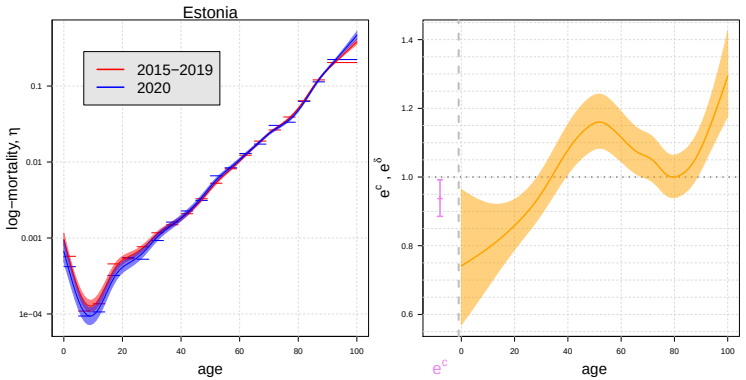

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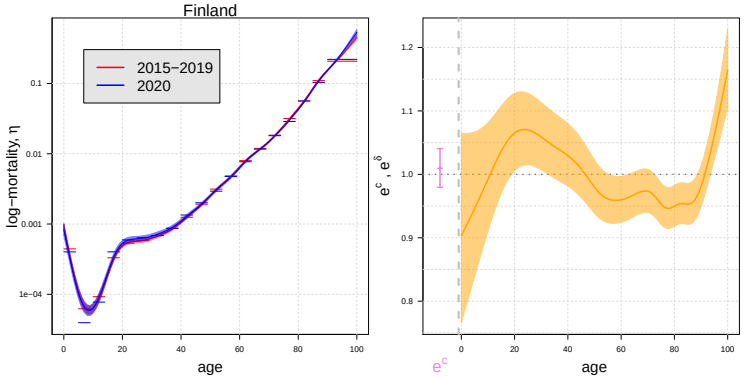

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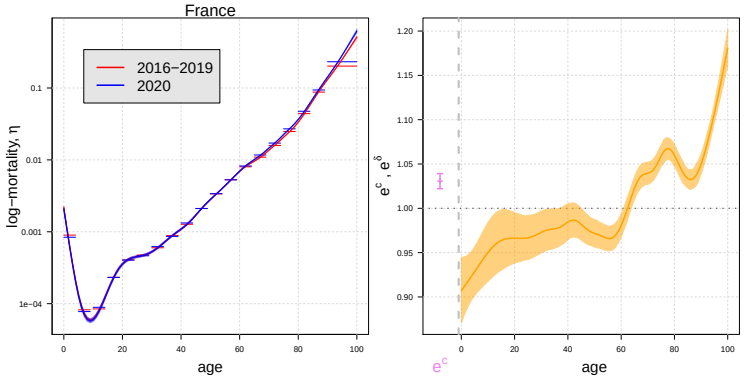

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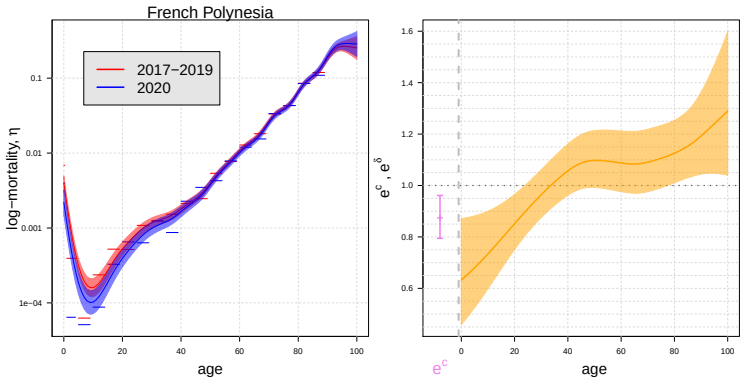

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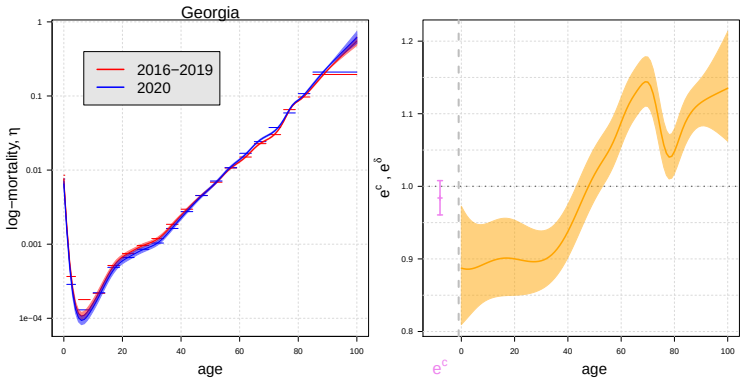

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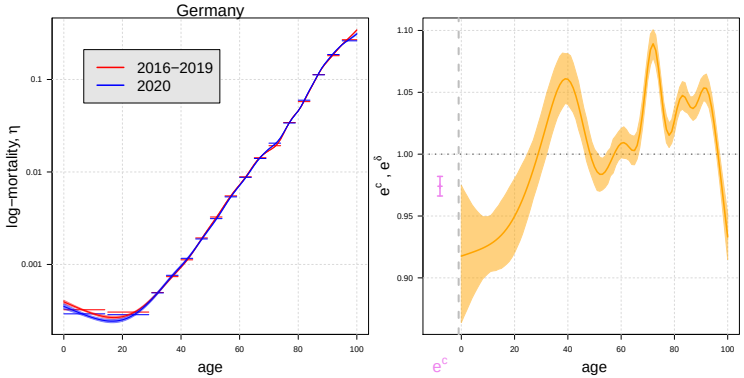

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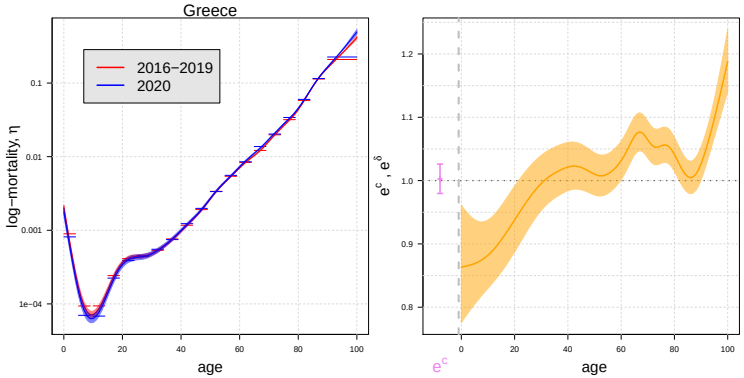

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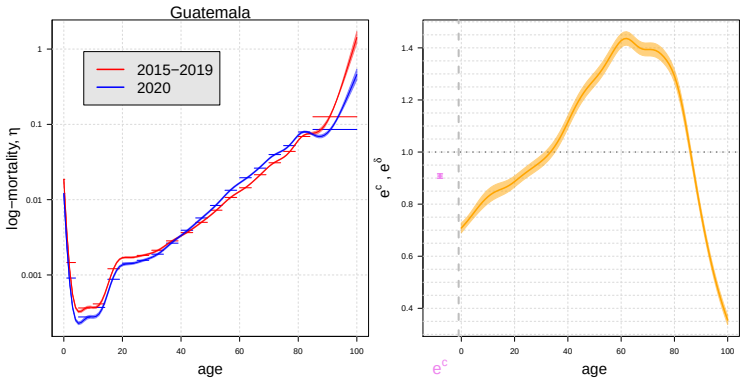

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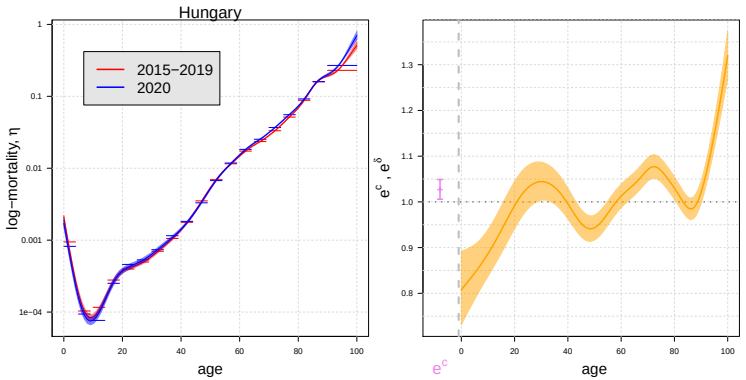

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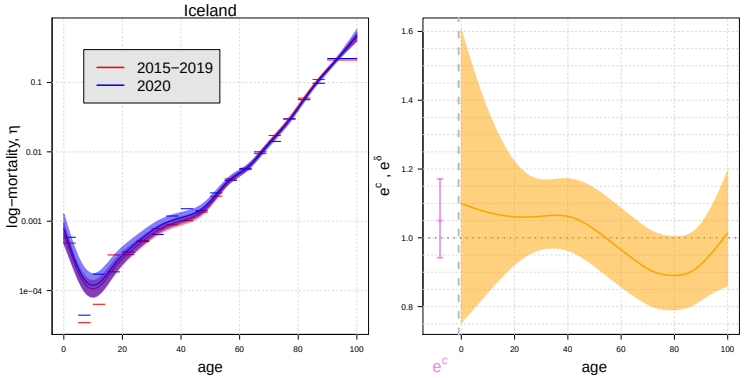

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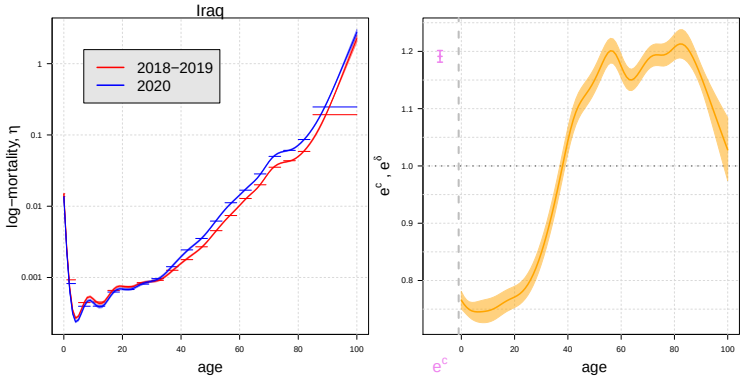

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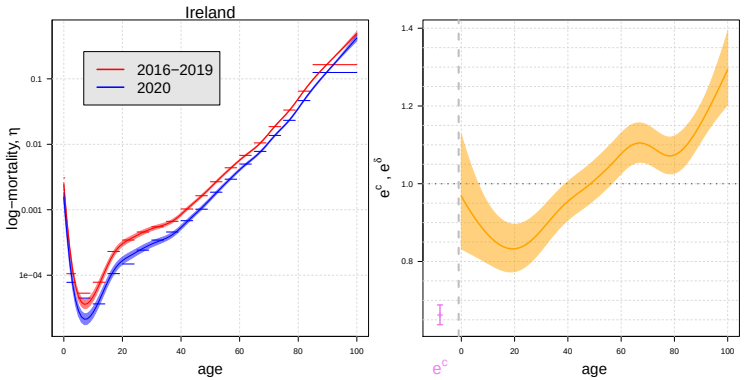

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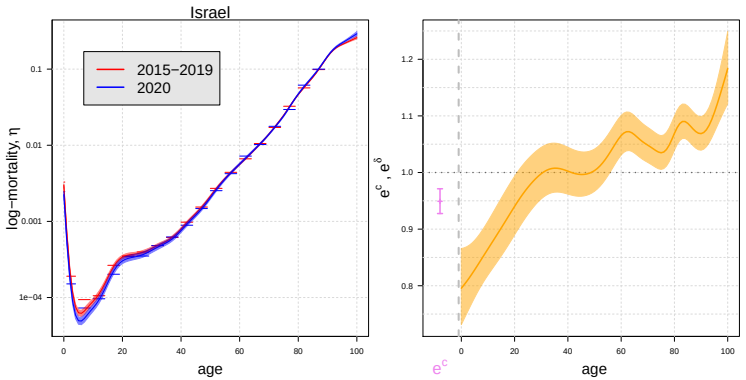

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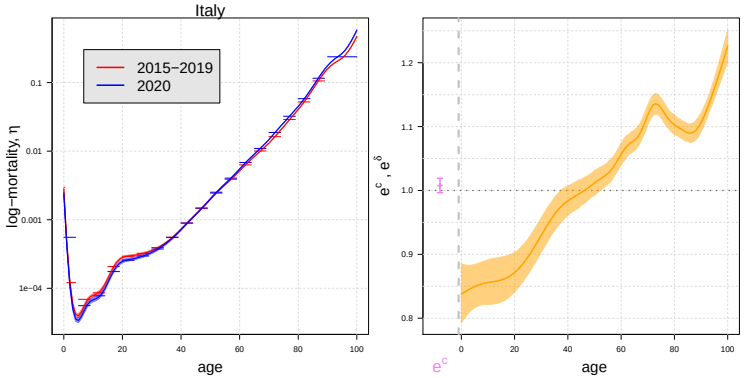
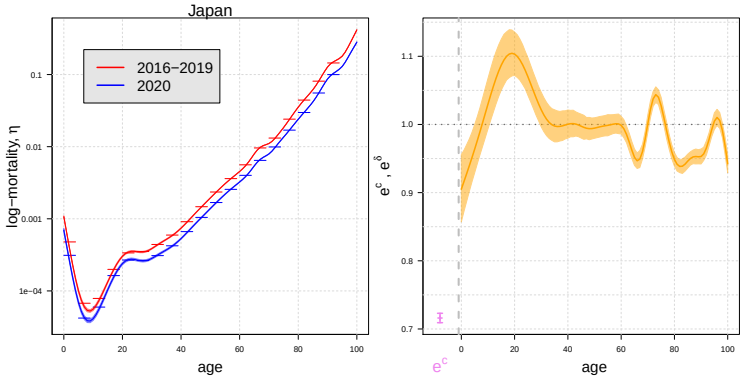


All populations



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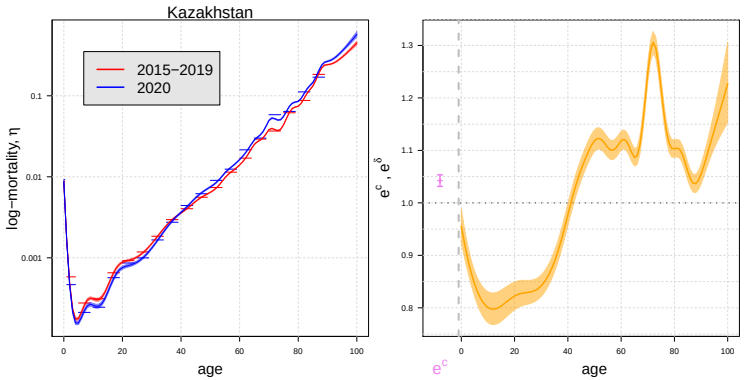

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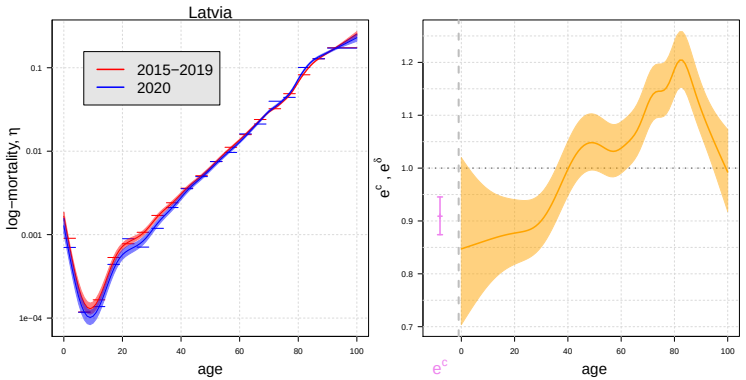

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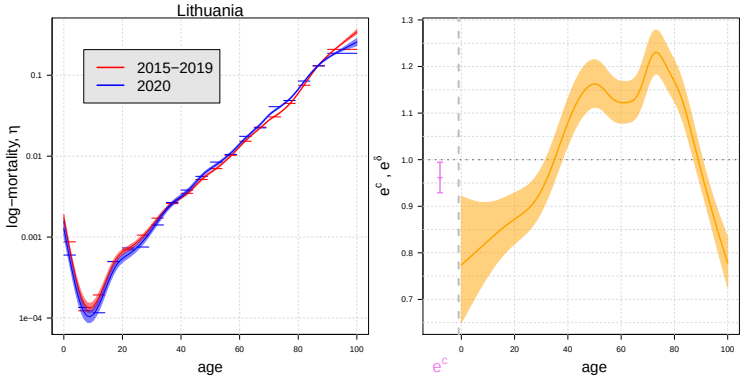

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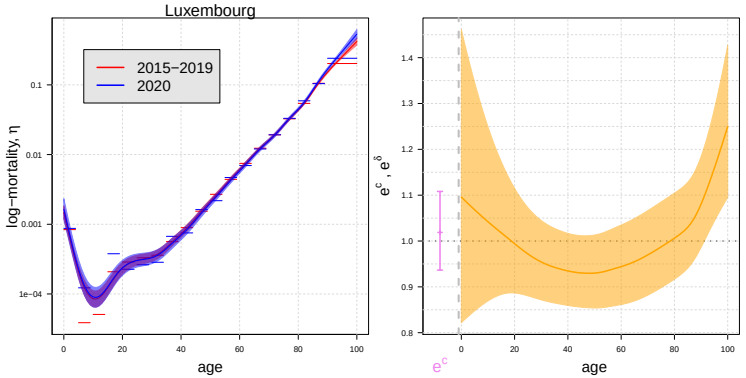

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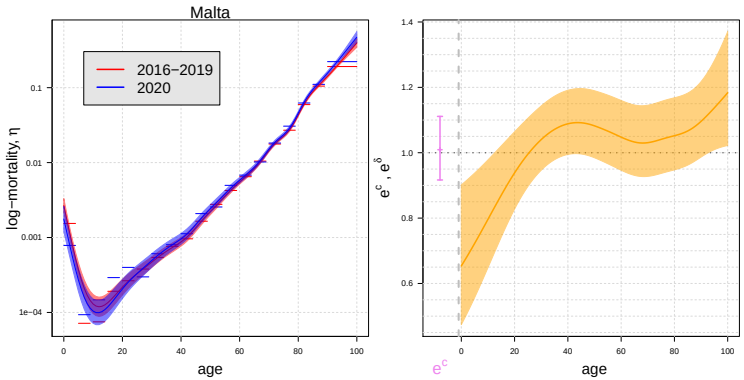

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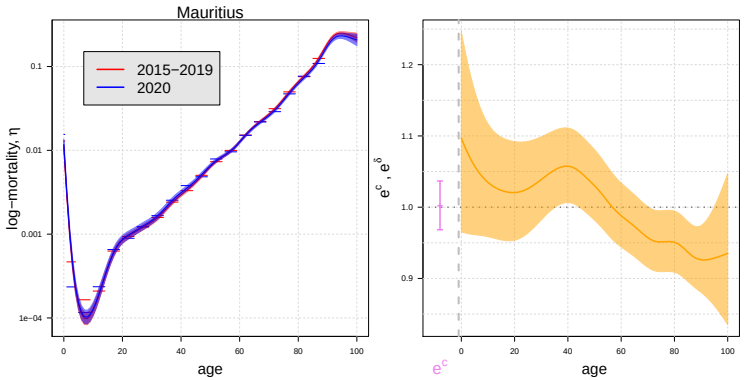

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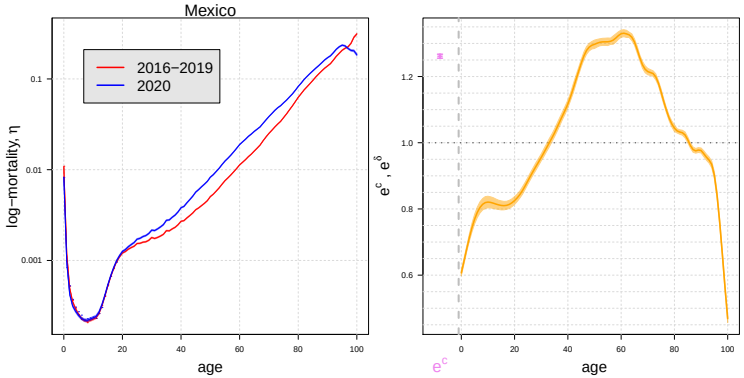

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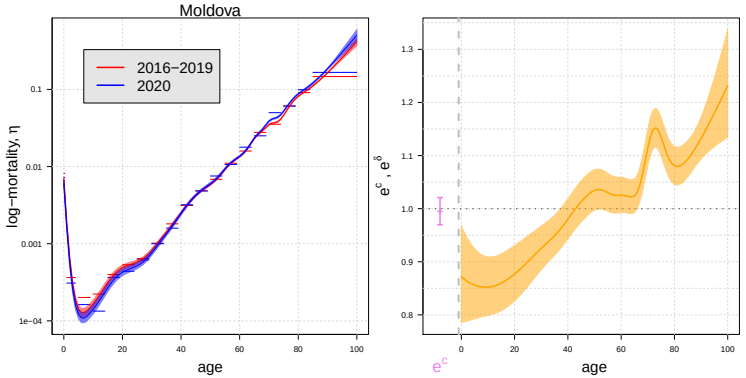

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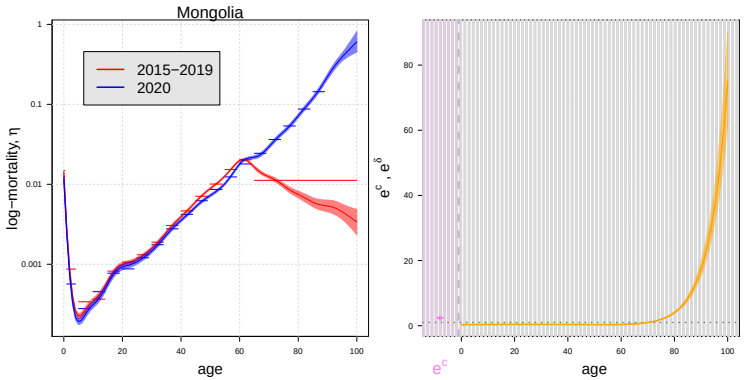

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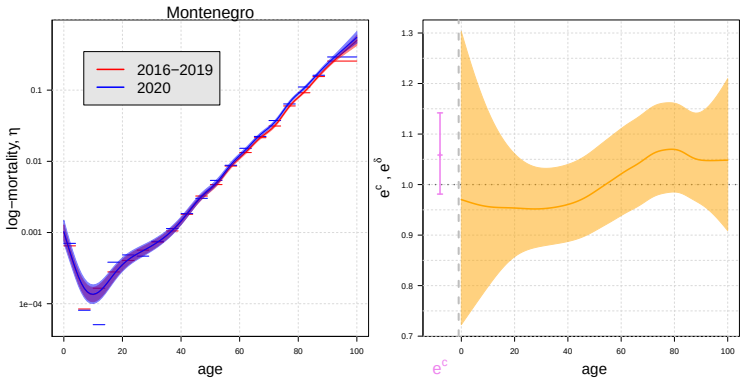

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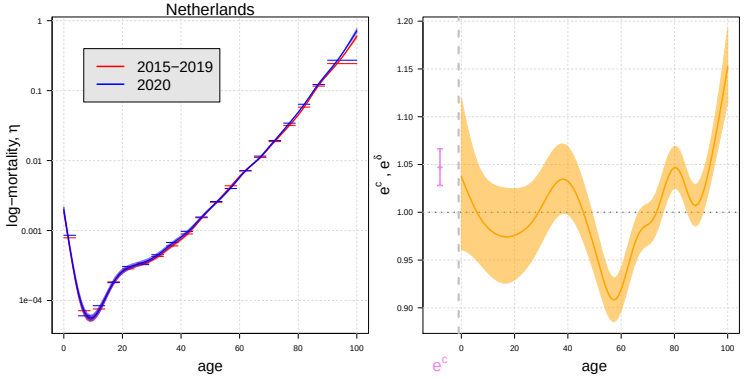

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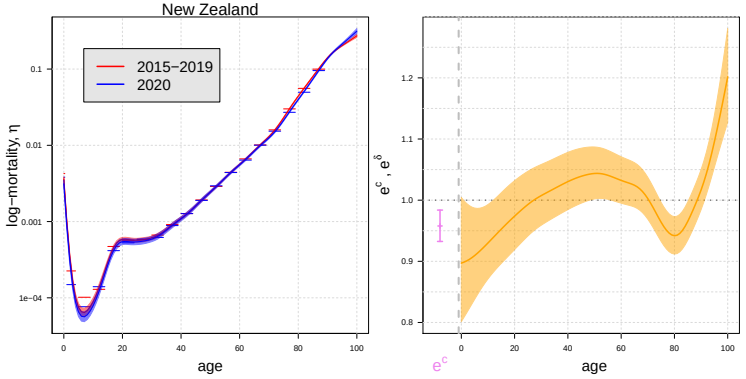

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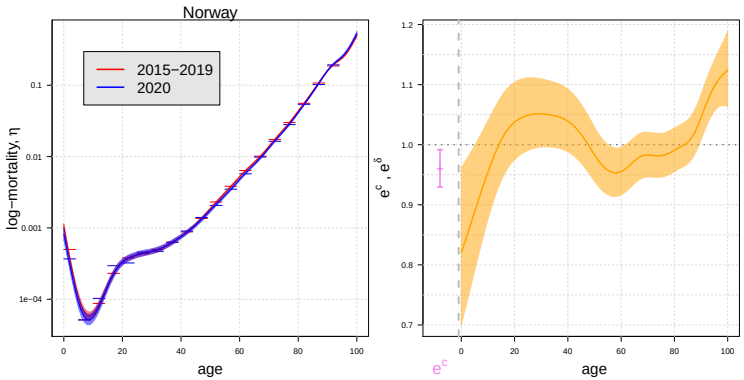

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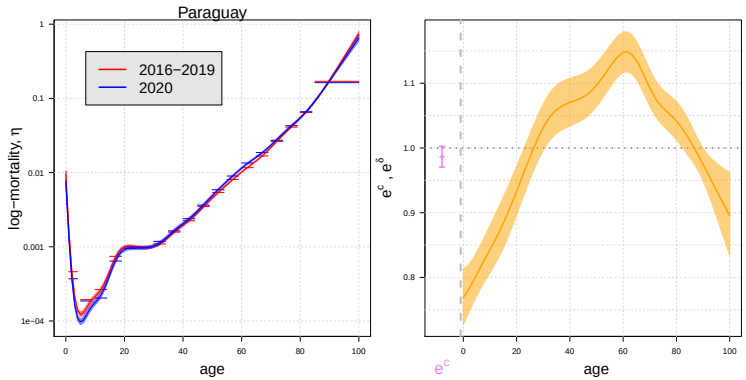

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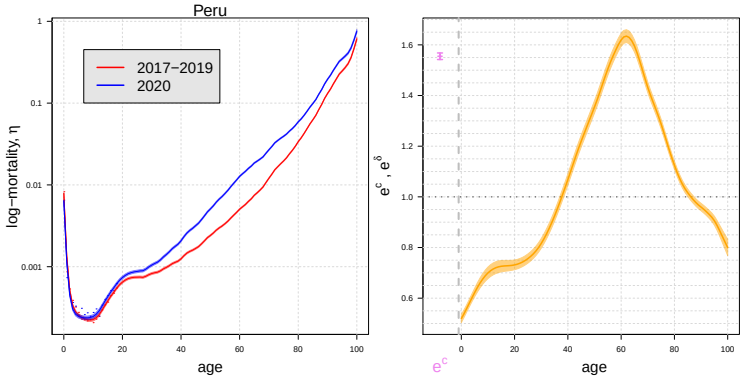

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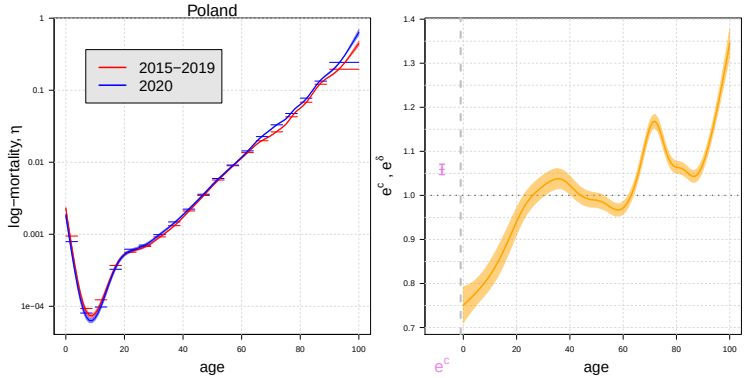

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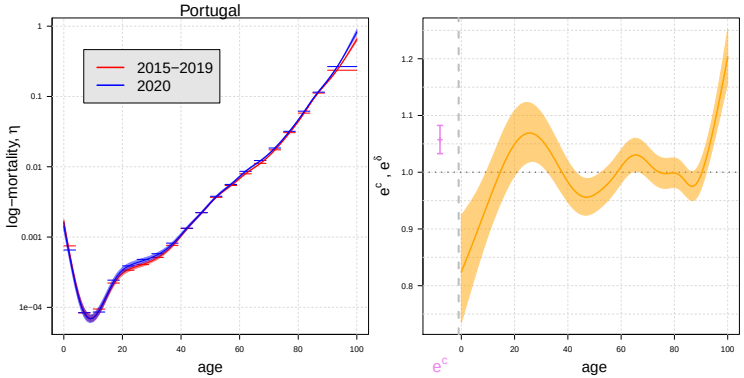

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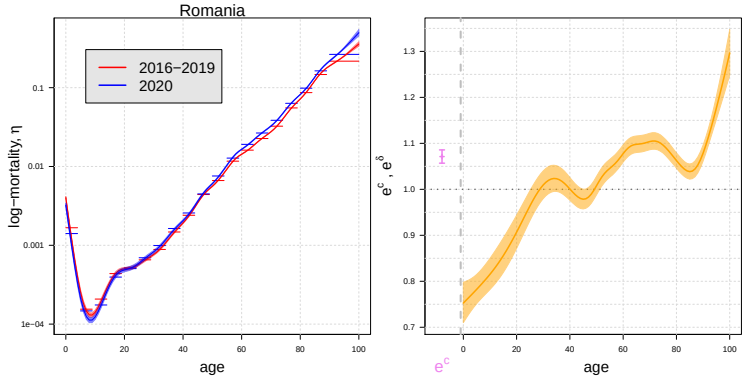

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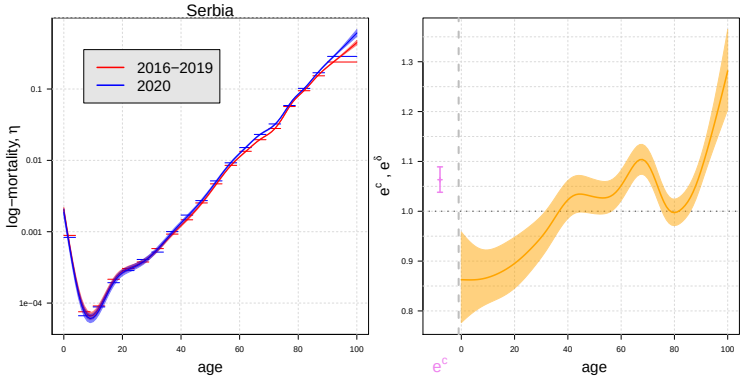

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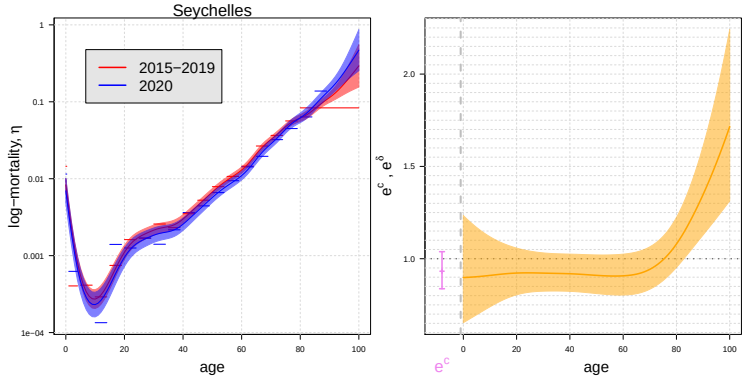

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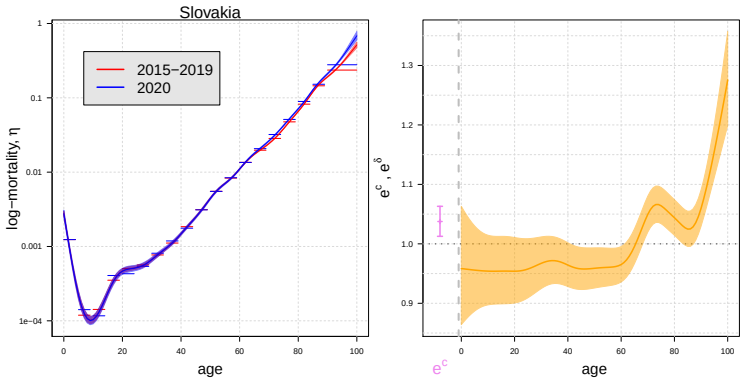

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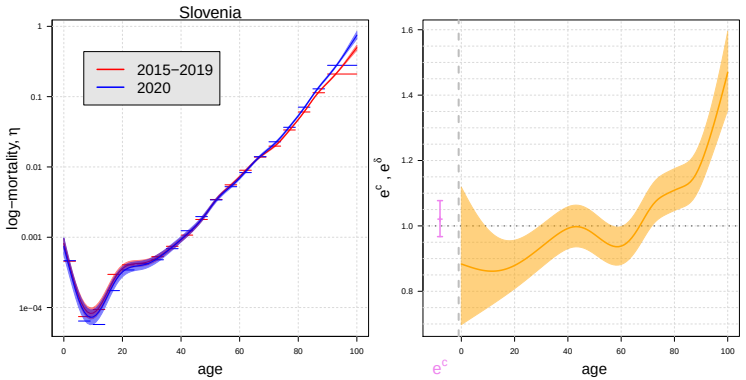

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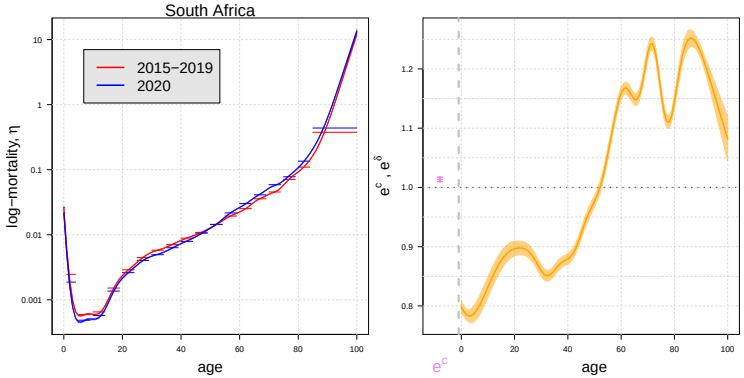

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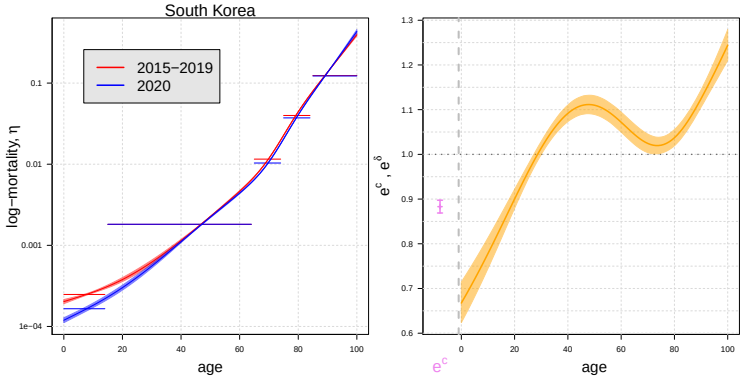

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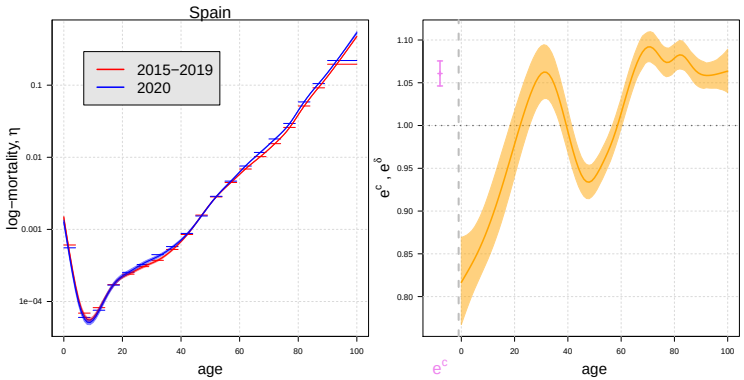

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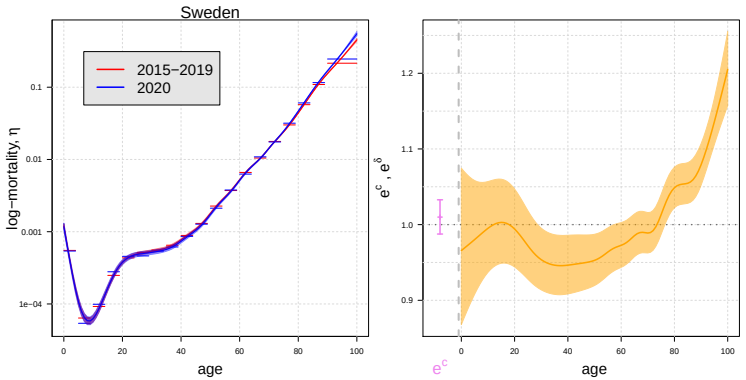

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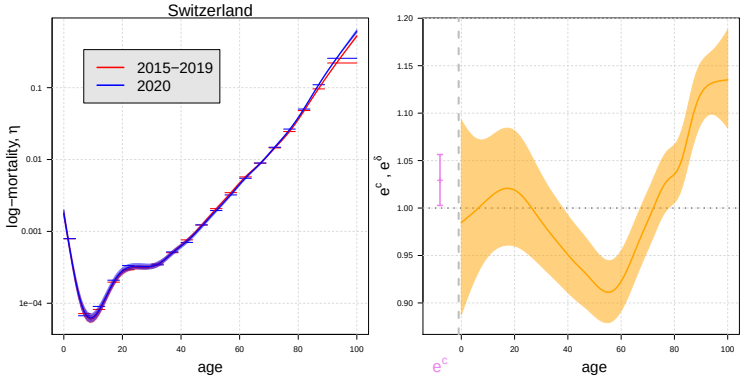

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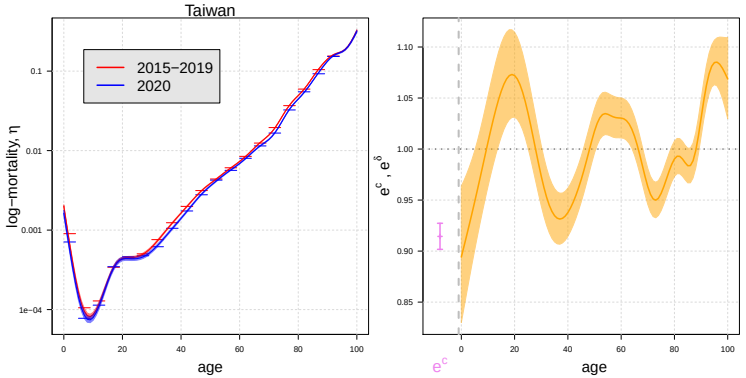

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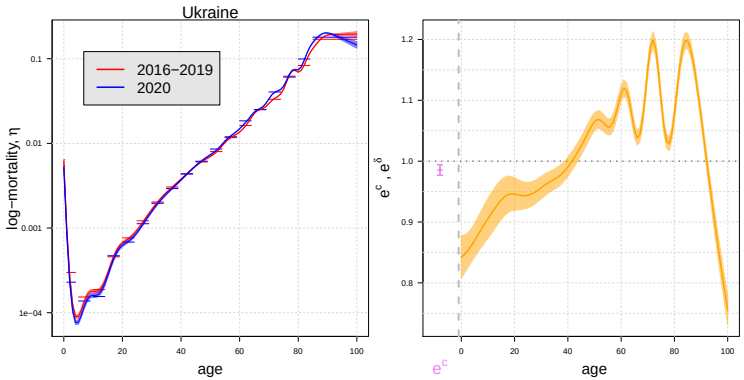

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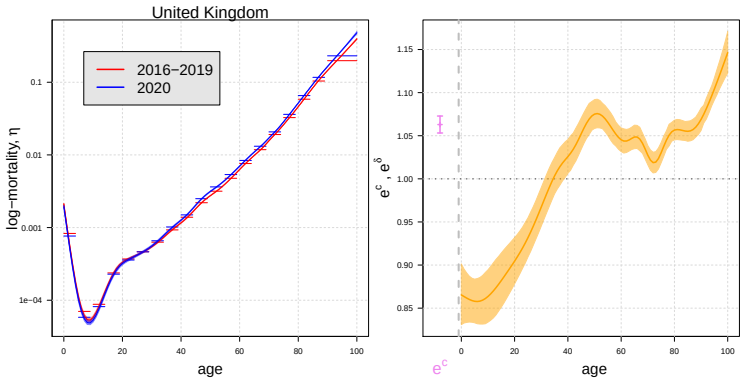

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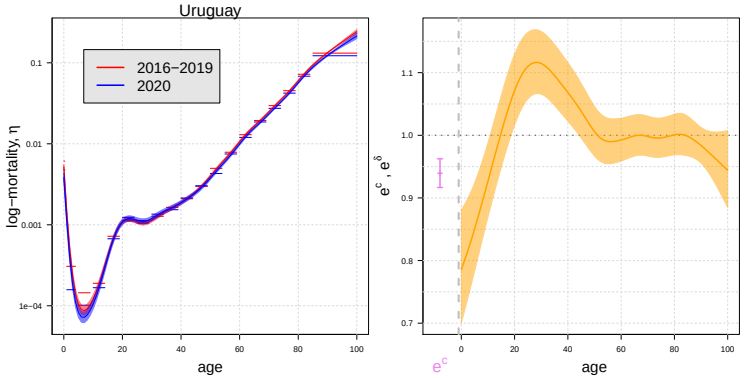

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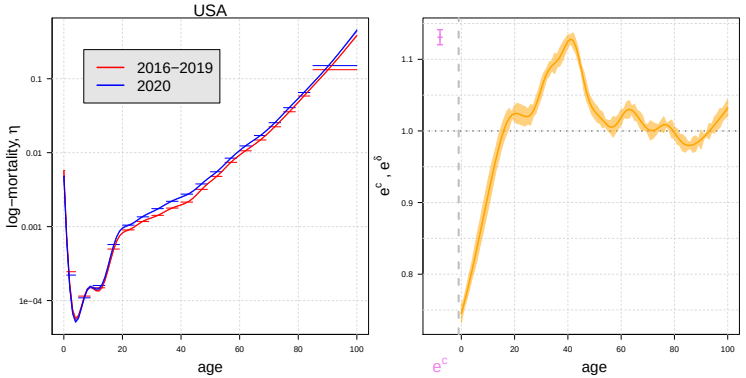
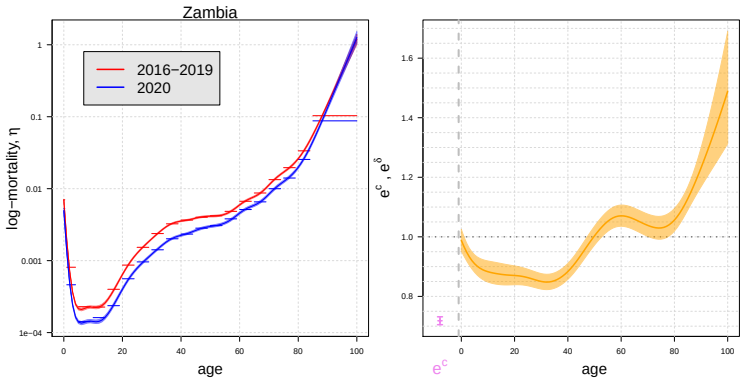
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