Groundwork to produce nowcasts on Intentional Homicide

Nowcasts, why are they needed

Data timeliness key requirement for:

- monitoring sustainable development
- providing timely evidence for policy making
- particularly important for certain topics (violence, drug trafficking routes, spread of psychoactive substances)

Priorities for nowcasts production

- Violent crime
  - 16.1.1, Number of victims of intentional homicide per 100,000 population, by sex (victims per 100,000 population)
- Criminal Justice System
  - 16.3.2, Unsentenced detainees as a proportion of overall prison population (%)
- Drug use
  - Prevalence of drug use
  - Drug-related mortality
- Trafficking routes based on individual seizures data (drugs, protected wildlife, firearms)

UNODC data collections

Drugs:

Demand (use, treatment, mortality, etc.)

Supply (production, seizures, prices, etc.)

Monitoring of new substances

Crime:

Violent crime and other crimes

Criminal justice operations

Trafficking in persons

Trafficking of firearms

Trafficking of protected wildlife

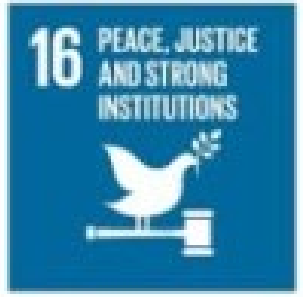
Data sources: officially collected data from Member States, complemented with data from other International Organizations, academia, NGOs

Challenges

Challenges to produce timely data on crime and drugs:

- current data collection/production cycle results in a 2-year gap between reference and publication year.
- Data availability still a challenge for certain regions (e.g Africa) and certain topics (eg drug use)
- Data standardisation/comparability still developing
- With some exceptions, long time series often not available
- Political sensitivity of several data topics: use of national official data is preferred, use of other data needs to be explained.

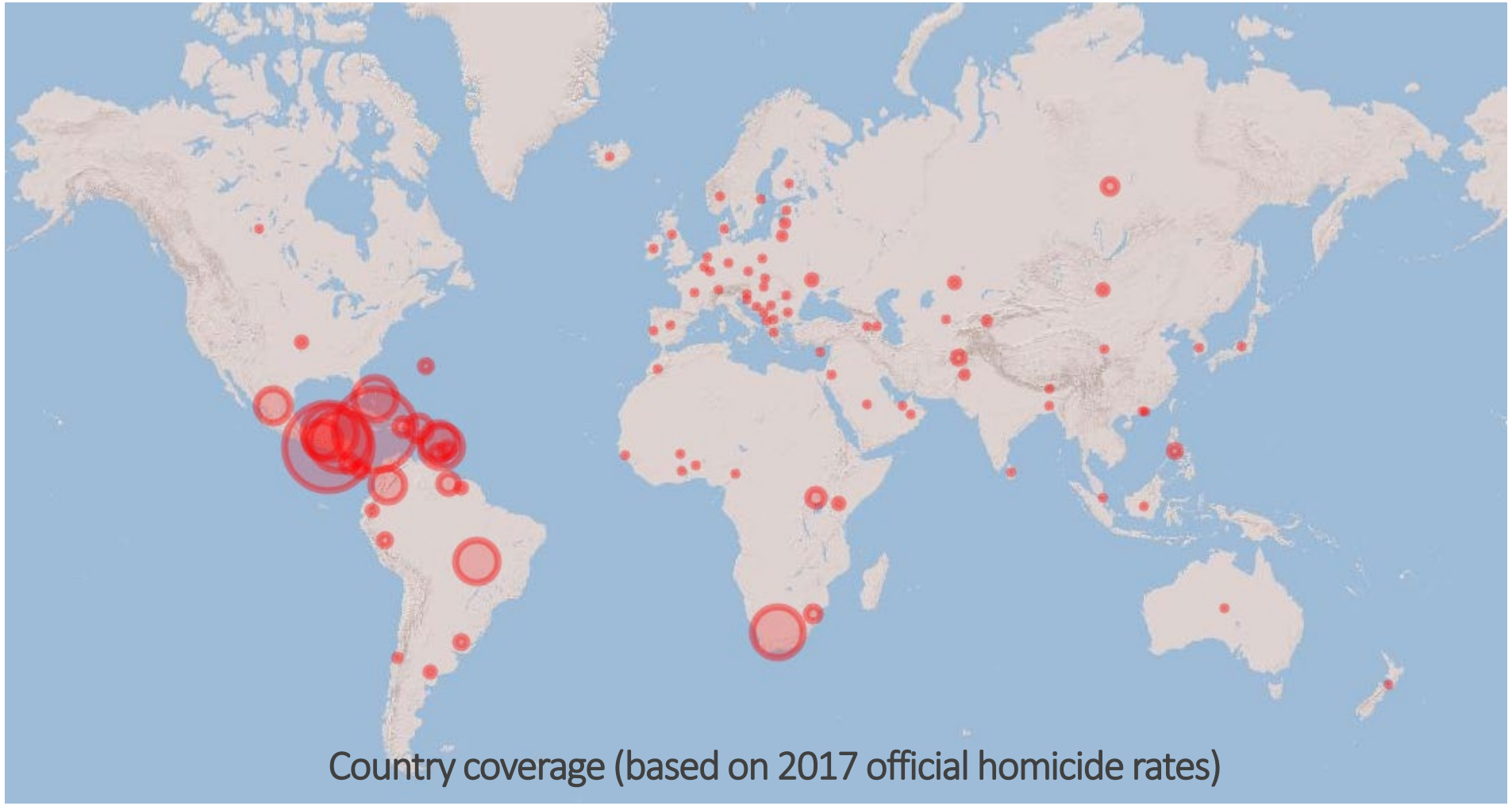
Case study: applying the **Exponential Weighted Moving Average** to **Homicide** data



Why the Exponential Weighted Moving average?

- Uses all available information to impute missing values as weighted average of the last n available data-points, where the weight decreases exponentially with each previous period. Any imputed value receives higher contribution from the more recently available information.
- Produces “conservative” imputations, homicide rates are generally stable in time
- Provides an adaptive algorithm that can be used for all countries, irrespective of homicide patterns and differences in data availability

Why have we started from the Homicide study?



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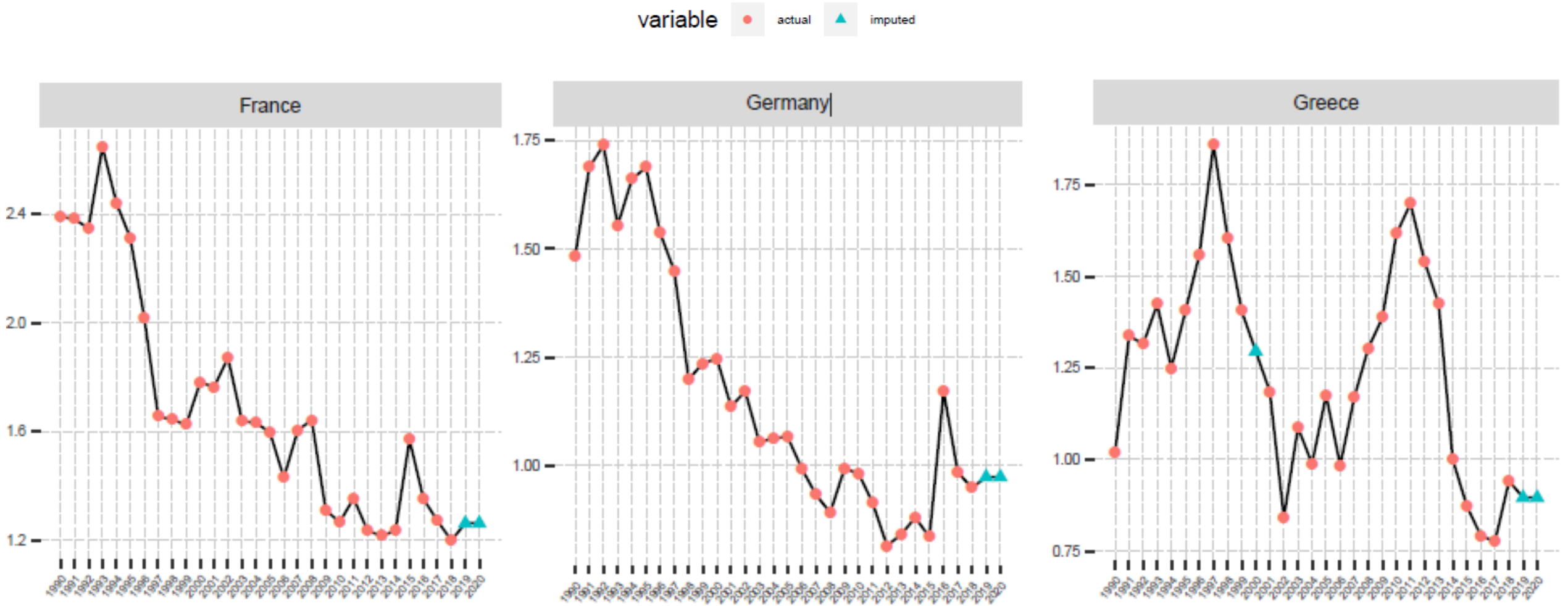
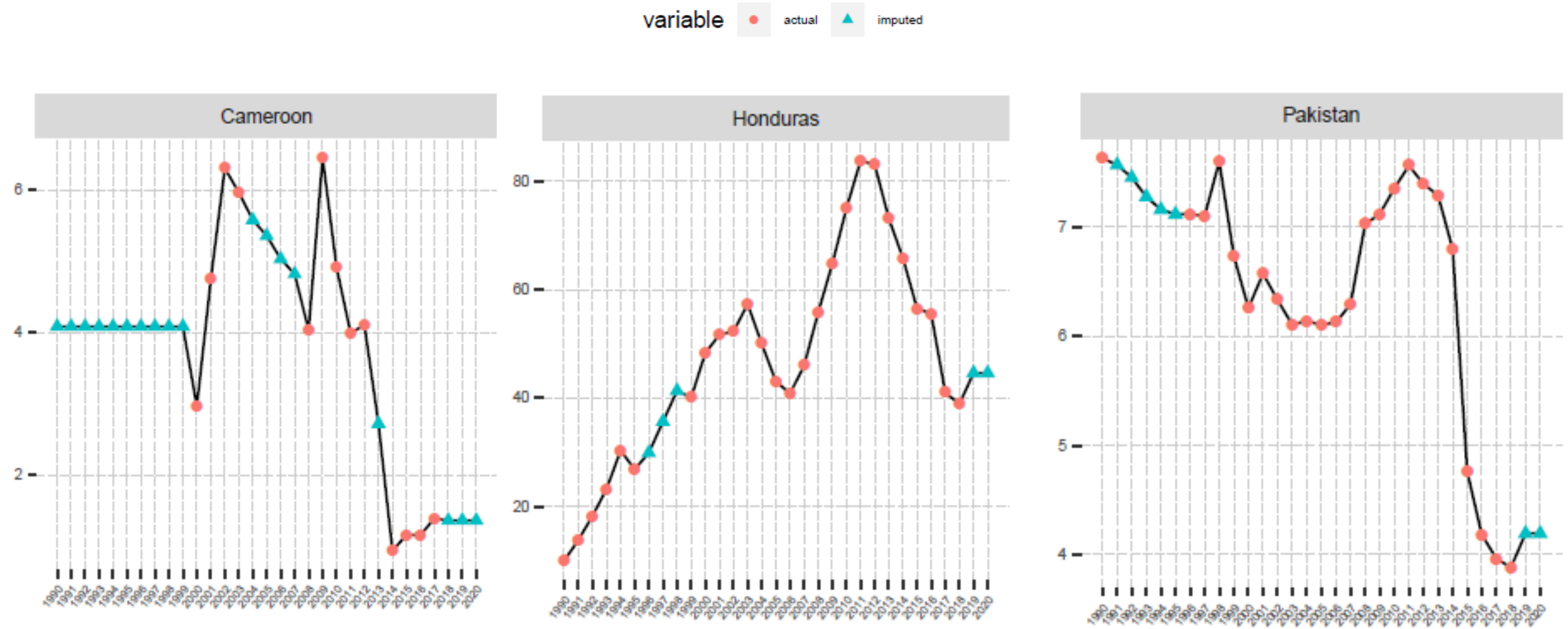
Exponential Weighted Moving Average: results

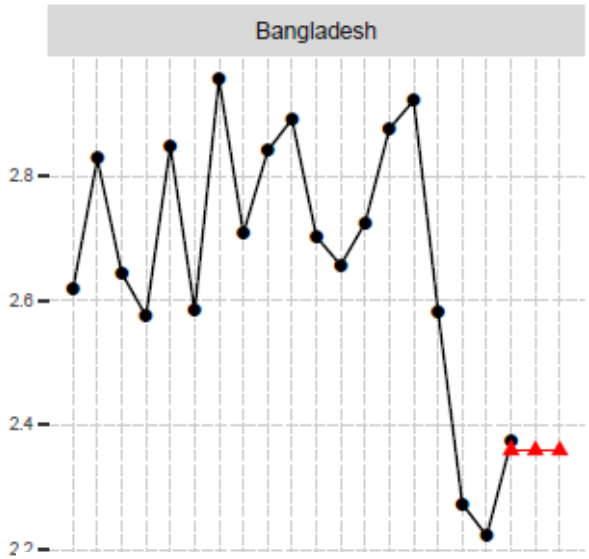


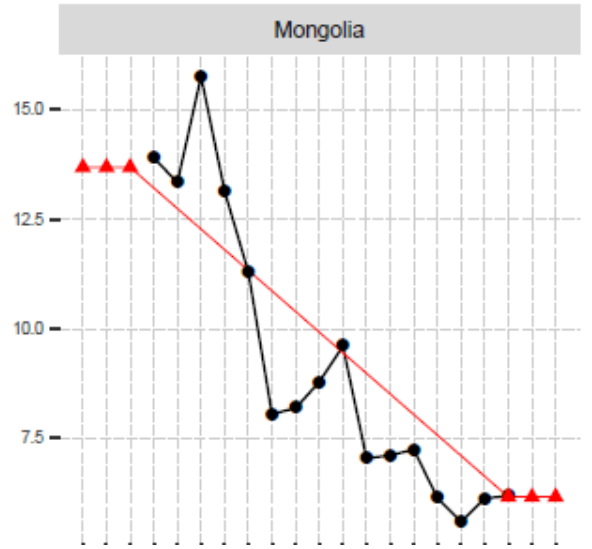
Exponential Weighted Moving Average: results

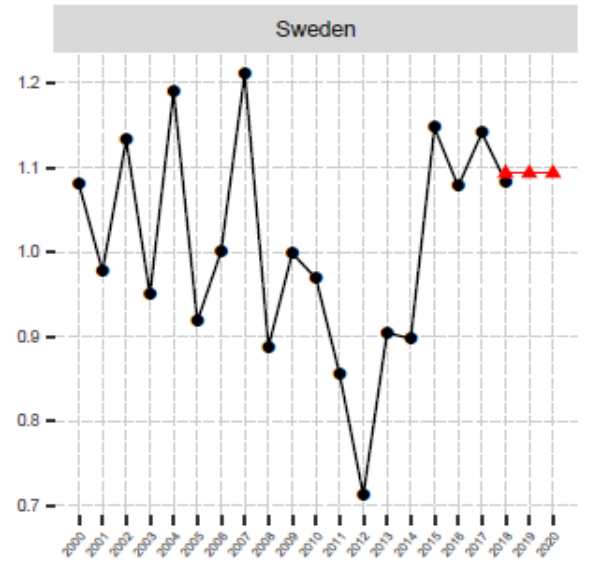


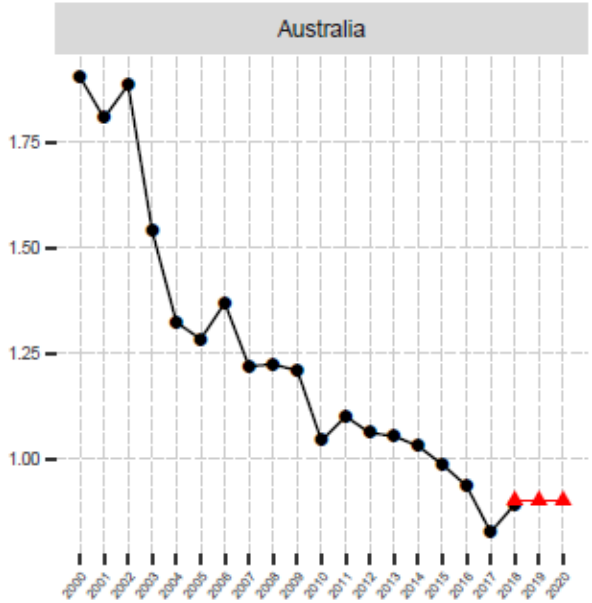
Where does the model fit the best?

country name	year	actual	imputed
Afghanistan	2018	6.6555472	7.0224903
Argentina	2018	5.3244967	5.7577912
Australia	2018	0.8916379	0.9013716
Azerbaijan	2018	2.2010050	2.1441501
Bangladesh	2018	2.3733246	2.3597637
Bulgaria	2018	1.4747589	1.4233573
Colombia	2018	25.5069370	25.8038220
Germany	2018	0.9479813	0.9975694
Greece	2018	0.9408858	0.8505299
Ireland	2018	0.8715501	0.8507856
Mongolia	2018	6.1829653	6.1632965
Poland	2018	0.7304467	0.7526222
Republic of Korea	2018	0.6038459	0.6597254
Republic of Moldova	2018	3.8993090	4.0703482
Serbia	2018	1.2268545	1.2034826
South Africa	2018	36.3988718	34.5112462
Spain	2018	0.6210781	0.6563051
Sri Lanka	2018	2.4212163	2.4513461
Sweden	2018	1.0830325	1.0930806
Switzerland	2018	0.5864415	0.5580909
Uganda	2018	10.5244682	11.4508054



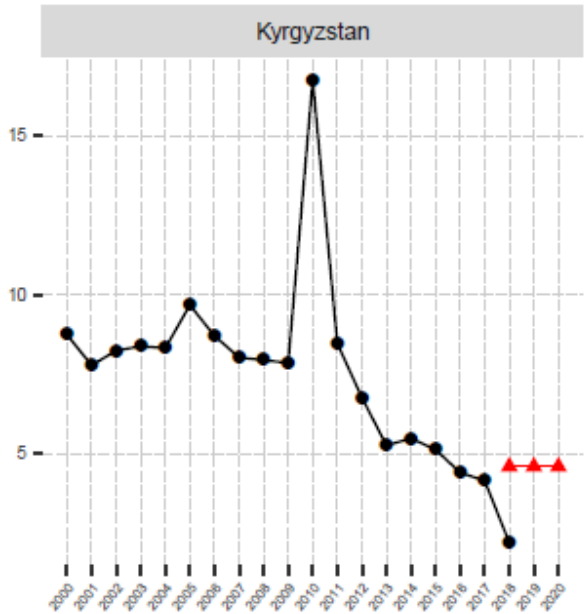


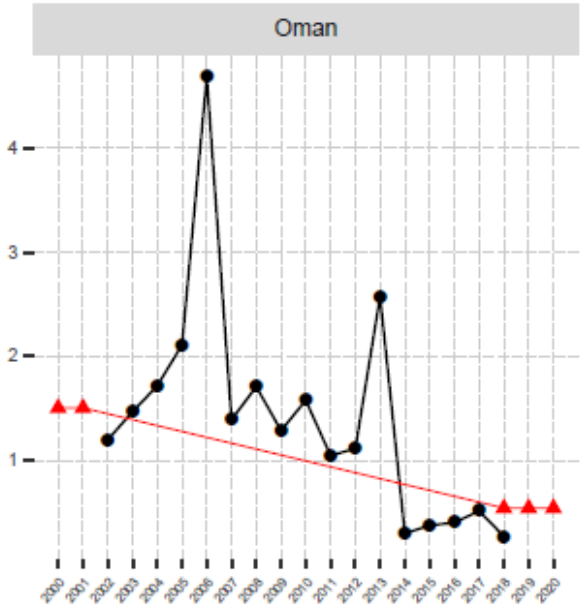




Where does the model fail?

Country name	year	actual	imputed
Armenia	2018	1.69376694	2.5465437
Croatia	2018	0.57747834	1.0452631
Kenya	2018	3.05294495	4.8841700
Kyrgyzstan	2018	2.18908629	4.5814374
Oman	2018	0.26920688	0.5418518
Singapore	2018	0.15633142	0.2415968
Slovenia	2018	0.48123195	0.7877614
State of Palestine	2018	0.39070533	0.7811142
Venezuela (Bolivarian Republic of)	2018	36.07851283	57.0686400





Exponential Weighted Moving Average: conclusion

Pros

- The exponential EWMA provides an adaptive algorithm which can be used both to impute missing values (fill the gaps in the time-series) and to extrapolate/nowcast homicide rates
- It uses all available information in a time series
- Broad availability of R open-source packages (imputeTS)

Cons

- Extrapolated values always lay in the range between the min and max of the time series
- the model fails in predicting extraordinary events

Nowcast and new technologies

Explore ´early warning´ information through technologies based on **web scraping**

Future initiatives:

- Test methodology to web scrape media news on specific events (drug seizures and homicides) to identify and reports on them
- Use the potential of news reported on media and social media to **complement available official data**

Challenges:

- Properly identify single events, develop algorithms to clean duplicates
- Manage multi-source databases and embed this new data source in the methodological framework to produce nowcast.

Thank you!