

## Demographic Now-Casting: Population Forecasting Using Diverse Data

### Rationale of the Demographic Now-Casting Group (DNCG):

Now-casting means making visual and tabular estimates of sub-group outcomes over time, forecasting either within- sample or using extrapolation. We include a grey area showing the possible error range (eg Abel, 2015). In recent years, now-casting has been reinvigorated by Bayesian methods in statistics which enable new achievements, not restricted to the use of a single data source at one time (eg Raymer and Wiśniowski, 2018; Wiśniowski, et al. 2020; Lunn, 2013).

We aim to disseminate new methods of now-casting, thus increasing the number of qualified scientists capable of advanced data analysis, visualisations, and scientific interpretation. The analysis methods are entirely developed in the last 8-10 years: Bayesian multiple dataset regression estimation; Bayesian estimation using qualitative expert data alongside secondary survey data; and methods of statistical forecasting as applied to the time-series of recent periods in the COVID-19 epidemic and the recovery period. This Scientific Group focuses on demographic research methods, open-access sharing of programming code, training and improvements in forecasting methods, especially socio-demographically differentiated now-casting. We are committed to ensuring that predictive intervals are visible for readers of tables and diagrams, so we are diverging from the 'confidence interval' tradition. The new practice uses 'predictive intervals', which display at 95% probability the range of any estimate or prediction. By using subject-specific examples, the next paragraph explores some of the possibilities.

We are studying several specific socio-economic applications of these methods, eg unemployment across intersectional social groups. A second area is work time in time-use diary data in multi-country South Asian comparative settings. Thirdly we are studying the causes of people migrating both within and between countries. Lastly, child labour (Kim, et al., 2020; Kim is an early-career researcher). The outcomes which we can graph include (a) the regression coefficients with 95% predictive intervals; (b) marginal predictions with 95% intervals on direct and indirect effects and interaction effects; and (c) point predictions for future dates. We use a new mode of model-testing that holds back part of the dataset for within-sample predictive testing. In all cases, our data can be either random samples or population data, or a mixture of both.

### Practical Aspects of the DNCG Group:

The DNCG aims to exist for ten years in total. This proposal covers the first 3 years. We aim to reach 35 stakeholder groups, 45 face-to-face workshop participants, 20 early-career researchers, and 120 online webinar/workshop participants.

### Experts in the Group:

Name	Role	Expertise	Affiliation	Country of Interest	Gender
Prof. W. Olsen	Chair	Child labour, econometrics, women's work hours, and structural equation modelling	University of Manchester, Social Statistics	India, Bangladesh, Kenya	F
Dr A. Wisniowski	Leader	Demography, migrant experiences, now-casting, Bayesian methods of estimation, and multilevel modelling over time	University of Manchester, Social Statistics	International, India	M
Prof. James Raymer	Leader	Multiregional demography and forecasting	Australian National University	ASEAN, cross-comparative Asia & Pacific, Australia	M
Dr Eduardo Fe	Leader	Treatment effects; cognition and well-being; econometrics of change over time	University of Manchester, Social Statistics	Cross-national comparative	M
Dr Jihye Kim	Leader	Youth unemployment and child	University of	India, Bangladesh,	F

		labour, time-use diaries, Bayesian modelling, and multiple-dataset models	Manchester, Social Statistics	Korea, Ghana	
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Additional members have already offered to be active in our Group, including joining APA and doing workshops. These are Dr Manasi Bera, an expert in the economics of migration and assistant professor at Tata Institute of Social Sciences; and Dr Tina Hannemann TBC, an expert in demography and health, lecturing in Social Statistics at the University of Manchester.

### The Group's Activities:

In 2023, we hold two 4-hour face-to-face workshops with both a training and seminar element. They are hybrid in mode, each for up to 20 people in person and 100 online, with shared a meal **funded by the leaders' funds in the University**.

- **Workshop 1:** Now-casting Using Bayesian Regression Predictions: Cross-sectional and Time-series Intersectional Forecasts for Migrant & Ethnic Groups by Sex
- **Workshop 2:** Estimating a Demographic Model with Two Datasets at Once

We publish one training briefing paper each, aimed purely at population scientists, based on these workshops in the **Cathie Marsh Institute working papers series** after peer review.

In 2024, we organise themed sessions on 'Visualising Results of Demographic Forecasts' at one international conference in sociology and one international conference in population studies in Europe. We then organise an expanded session on 'Now-casting and Forecasting: Social-Group Specific Forecasts and Statistical Options' at the APA conference 2024. To attend the APA 2024 conference, we plan **four Scientific Group leaders to attend as self-funding participants**.

We develop a mailing list of interested stakeholders in Asia and international organisations. The Group's workshop and conference papers are entirely open-access. Our programming code is released for public use.

- *Invitations to Get Feedback on Demographic Papers*

Via APA, we invite up to 20 postgraduates residing in Asia to offer papers, and we will vet and peer-review proposed papers as the session organisers. In PhD study, more and more papers are now being produced, so quality control is ever more essential. Our invitations will be publicised so that post-PhD careers are boosted by a rich curriculum vitae. We aim **to support these postgraduates and early-career researchers residing in Asia to attend APA 2024**. Our support package is free for each one accepted **via session-specific early bird deadlines (we offer voluntary time reviewing)**.

- *Who Are Our Stakeholders?*

We have a track record in applied demographic research. Through this experience, we have numerous organisational stakeholder connections. The stakeholders include UN Women, UNICEF, UK, Korean, Indian and Bangladesh government representatives, IMF statistical experts, the International Labour Organization staff in their statistical department, and the academic-scientific communities in sociology, demography, social statistics, and social-science computing.

### References

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- Lunn, Christopher Jackson, Nicky Best, Andrew Thomas, and David Spiegelhalter, 2013, *The BUGS Book: A Practical Introduction to Bayesian Analysis*, CRC Press, Chapman and Hall.
- Raymer, James, & Arkadiusz Wiśniowski (2018) Applying and testing a forecasting model for age and sex patterns of immigration and emigration, *Population Studies*, 72:3, 339-355, DOI: 10.1080/00324728.2018.1469784
- Wiśniowski A, Sakshaug JW, Perez Ruiz DA, & Blom AG (2020). Integrating Probability and Non-probability Samples for Survey Inference. *Journal of Survey Statistics and Methodology*, 8(1).