

# Campion Grant Application Form

## Email:

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## Name:

Dr Angelo Moretti (Principal Investigator)

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## Project Title:

Mapping the bias of police records: An assessment of the impact of police data bias for crime mapping

## Project Timescale:

- Start date: 1st June 2020
- Literature review about police data biases: 31st July 2020
- Finish the simulation study: 31st July 2020
- Access to survey data and police records for application: 1st September 2020
- Submit first paper to the Journal of the Royal Statistical Society: Section A or Journal of Quantitative Criminology: 31st December 2020
- Present results at BigSurv20 Conference: 4th November 2020
- Develop future funding application: 31st March 2021
- Final seminar at MMU: May 2021
- Finish date: 31st May 2021

## Project Details:

Police-recorded crimes are the main source of information used by police forces to analyse crime patterns, investigate the spatial concentration of crime, and design spatially targeted strategies. Police statistics are also used to design and evaluate crime prevention policies and to develop

theories of crime and deviance. Nevertheless, crimes known to police are affected by biases and unreliability driven by unequal crime reporting rates across social groups and geographical areas. The measures of error that affect the reliability of crime statistics is an issue that merits deeper scrutiny, since it affects police everyday practices, criminal policies and citizens' everyday lives. Yet it is an understudied issue, and the implications of data biases for crime mapping are unknown. Moreover, police analyses are moving towards the study of smaller levels of geography than ever before, such as street segments with highly homogeneous communities. Maps produced from police records are used to foreground the micro places where rates of recorded crimes are larger. This project will investigate the impact of data biases on crime maps produced from police records at the different spatial scales. Simulation studies and applications will be used to assess whether micro-level maps are affected by a larger risk of bias than maps produced at larger scales. In the applications, crime data recorded by Greater Manchester Police will be used.

Based on parameters obtained from the UK Census 2011, we will simulate synthetic populations consistent with the social-demographic and spatial characteristics of Greater Manchester. Then, based on model parameters derived from the Crime Survey for England and Wales 2011/12, we will simulate the number and type of crimes suffered by individuals across social groups and areas, and predict the likelihood of these crimes to be known to police. The Crime Survey for England and Wales is used since it is a probabilistic survey based on a complex survey design and it provides unbiased estimates. Thus, we will be able to compare the relative difference between all simulated crimes and police-recorded incidents at the different scales: Output Areas, Lower Layer Super Output Areas, Middle Layer Super Output Area, wards and Local Authority Districts. Our hypothesis is that the measures of dispersion of the relative difference between all crimes and police records will be much larger when crime incidents are aggregated at the level of small geographies. In other words, we expect to show that, when producing maps at the scales of medium-level geographies, the percentage of crimes unknown to police is similar in all areas, and thus the risk that police statistics underestimate or overestimate crime rates in some areas more than others is small; whereas the percentage of unknown crimes may vary widely across micro places.

This has important implications for policing, policy making and research. Police strategies, criminal policies and criminological theories drawn from police records aggregated at the scales of small communities may be affected by large biases that underestimate the prevalence of crime in certain places while overestimating its prevalence in others. Police data recorded by Greater Manchester Police will be used to study the impact that data biases have on micro-level maps produced from crimes known to police. The proposed research will generate impact based on being the first study in the UK and elsewhere assessing the impact of police data bias for crime mapping.

The research involves analysis of existing secondary data sources available from the UK Data Service (UKDS) and the Office for National Statistics (ONS). All research will be conducted considering ethical principles in research and police practise, and we will abide by the terms of the end and user license agreements of UKDS and ONS. Our analysis will use fully anonymised datasets. Angelo Moretti (MMU) and David Buil-Gil (UoM) will contribute their time *pro bono* to conduct analyses, write reports and papers, and disseminate results in meetings and seminars. This amounts to 40 working days for Angelo Moretti and 30 working days for David Buil-Gil. We aim to appoint a Research Assistant at MMU, Samuel Langton, to work on the project for 35 days. MMU and UoM will also provide facilities for research, and computing and software capabilities for data processing and analysis at no cost to the Manchester Statistical Society. MMU will also host the

final seminar of the project to disseminate the project results to police forces, practitioners and members of the Manchester Statistical Society.

The results of this research will be presented at the Big Data Meets Survey Science Conference - BigSurv20 (November 2020, Utrecht, Netherlands), and at least one paper will be published at a first quartile journal in Statistics (e.g. Journal of the Royal Statistical Society: Section A) or Criminology (e.g. Journal of Quantitative Criminology). Authors will acknowledge the support of the Manchester Statistical Society in all papers, conference presentations and other dissemination outlets that arise from the project. We will also produce an 8-page summary of the key findings of their project to be disseminated by the Manchester Statistical Society. Furthermore, the outputs of this project will pioneer innovative approaches in policing in Greater Manchester that will then inspire police developments at the national level. It will also lay the foundations for a long-term follow-on project (potentially funded by 'Secondary Data Analysis Initiative' of ESRC).

## Researcher's background:

### Angelo Moretti

Angelo Moretti is a Lecturer in the Department of Computing and Mathematics at Manchester Metropolitan University. His research interests cover topics in small area estimation, survey statistics, data integration, statistical modelling and multivariate statistics with strong emphasis on crime, wellbeing and poverty indicators at small geographical level. He is also very much interested in topics related to data quality and official statistics.

Angelo holds a Bachelor in Economics and a Master's in Marketing and Market Research (Survey Methods pathway) from the University of Pisa. Angelo obtained a PhD in Social Statistics from the University of Manchester in March 2018. In his PhD he developed multivariate small area estimation methods to provide multidimensional estimates of wellbeing indicators at small area level.

Before his current position at the Manchester Metropolitan University he was a Research Associate in Small Area Estimation Methods at the University of Sheffield (2017-2018) and Research Associate in Social Statistics at the University of Manchester (2019). During his work at the University of Sheffield he proposed methodological advances in the field of small area estimation under microsimulation approaches.

Angelo is currently a member of the European Survey Research Association and a Fellow of the Italian Statistical Society.

### David Buil-Gil

David Buil-Gil is a Research Fellow in Cybercrime at the Digital Trust and Security theme of the University of Manchester. His research areas cover geographic criminology, small area estimation applications in criminology, crime mapping, measurement error in criminological research, emotions about crime, perceptions about the police, new methods for data collection and open data.

David holds a Bachelor's in Criminology from the Autonomous University of Barcelona (2011-2015) and a Master's in Crime Analysis and Prevention from Miguel Hernández University of Elche (2015-

2016). David obtained his PhD in Criminology at the University of Manchester in December 2019. In his PhD research, he applied model-based small area estimation techniques to criminological research in order to produce estimates and maps of confidence in police work, worry about crime, perceived neighbourhood disorder and the dark figure of crime at small area level. The results of his research have been awarded by the Archimedes Contest of the Spanish Ministry of Education, Culture and Sport, the Student Award of the Spanish Society of Criminological Research, and the Society of Chief Police Officers of Alicante (AJPLA). Before his current position at the University of Manchester, he was a JAEIntro Research Fellow at the Spanish National Research Council - CSIC (2014-2015), Research Assistant at CRÍMINA Research Center for the Study and Prevention of Crime - Miguel Hernández University of Elche (2015-2016), and Teaching and Research Assistant at the Schools of Law and Social Sciences of the University of Manchester (2017-2019). Currently, David is member of the Board of the Spanish Society of Criminological Research (SEIC), co-coordinator of the SEIC Working Group on Quantitative Criminology, member of the Board of the Spanish Network of Early Career Researchers of Criminology (REJIC) and member of the European Society of Criminology.

## Affiliations:

Angelo Moretti. *Department of Computing and Mathematics, Manchester Metropolitan University*  
 David Buil-Gil. *Department of Criminology, University of Manchester*

## Grant Requested:

Strand 2: Projects that examine the contemporary economy, society and government of the North West region

## Funding Breakdown:

Item	Notes	Cost
Research Associate (Samuel Langton)	35 days (262.5 hours)	£6,811.01
Conference Costs (BigSurv20)	Registration £800, Flights £200, accommodation and subsistence £800	£1,800.00
Catering for final seminar at MMU	£7.50pp x50 people	£375.00
Article Open Access		£1,000
<b>Total</b>		<b>£9,986.01</b>

I consent to the information in this form being stored, shared with the members of the Campion Grant committee, and consent to be contacted regarding this application by email or telephone:

Yes