Title of PhD project	**Exploring adverse health outcomes in people with eczema using electronic health records**

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Brief description of project	Eczema is an irritating and burdensome disease that affects 20% of children and up to 10% of adults. It is also commonly treated in primary care so records from general practice are a valuable resource for the study of this disease. Analysis of routinely collected data has already shown that multiple health conditions cluster in people with eczema, including cardiovascular disease, fractures, and mental illness. There remain important unanswered questions. Which diseases cluster in patients with eczema, and by how much does eczema disease activity and severity explain these associations? Is it possible to accurately capture the proportion of patient's lives that are affected by eczema in routinely collected data? Measures of disease activity aim to capture the proportion of time in patients' lives which are affected by disease. This is distinct from disease severity, which aims to capture maximum disease severity. The project will develop a number of candidate algorithms to identify eczema disease activity in electronic health record data, and then validate these algorithms using data from cohort studies such as the Avon Longitudinal Study of Parents and Children, British Birth Cohorts (1958 and 1970), and UK Biobank. This diagnosis algorithm construction may also be extended to consider the impact of reduced GP consultation rates during the COVID-19 pandemic on the validity of the algorithm. The project will also extend previous work on multimorbidity to identify specific adverse health outcomes that cluster in people with eczema using network analysis methods. Large datasets of routinely collected data will be used to construct networks of disease clusters and compare these between people with and without eczema. This project will also use large datasets with information on demographics, medical

	treatments, and lifestyle factors. These data will be used to analyse the role of eczema disease severity and activity on adverse long term health outcomes through survival and mediator analysis. This innovative work, maximising the value of routinely collected data will, lead to a better understanding of the relationship between eczema and other serious illnesses and will facilitate similar work in other chronic diseases.
Skills we expect a student to develop/acquire whilst pursuing this project	Management of large datasets, survival analysis, mediator analysis, coproduction of research with patient groups, ethics and security of routinely collected health records
Particular prior educational requirements for a student undertaking this project	Epidemiology Statistical analysis (Stata/R or equivalent)
Project key words	Data science Mental illnesses Eczema
Possible under 1+4 route? Master's options identified.	Yes LSHTM – MSc Medical Statistics LSHTM – MSc Health Data Science LSHTM – MSc Epidemiology
MRC Core Skills developed through this project	Quantitative skills
MRC LID themes	Health Data Science
Further reading	Association Between Atopic Eczema and Cancer in England and Denmark *Please also see the supplementary materials for the above research paper.* Identifying longitudinal clusters of multimorbidity in an urban setting: A population-based cross-sectional study Atopic Eczema–Associated Fracture Risk and Oral Corticosteroids: A Population-Based Cohort Study