The Administrative Data Research Network Annual Research Conference 1-2 June 2017

Royal College of Surgeons Edinburgh

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Administrative Data Research Network

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As ADRN Director, I would like to welcome you to our 4th Annual Research Conference in the historic city of Edinburgh. Since the ESRC approved the business plan for the ADRN in 2013, I have been excited about this opportunity to increase the growth, use and understanding of linked administrative data. Our vision is to see administrative data transformed into knowledge and evidence that can be used to inform public and economic policy, helping to tackle some of the major issues facing society, in an innovative and efficient way. To make this vision a reality we are supporting research projects, both methodological and substantive, some of which you will hear about during this conference.

As the Network has become established, so has the ADRN Conference. This year we have invited speakers and accepted papers from across the world, as well as from ADRN researchers. I believe we are well on the way to making the ADRN Conference one of the principal international forums to present and discuss progress on administrative data research.

Despite our success so far, there is still more work for us to do to overcome the challenge of data access in the UK. One piece of good news is that the Digital Economy Act received Royal Assent on 27 April 2017. It contains a section on data-sharing, which amongst other aims, is intended to give researchers the ability to use public sector information to support their work, but with strict rules surrounding the security of that information. This will help to clarify the legal basis on which administrative data can be shared for research purposes.

Finally, I would like to thank the local organisers from ADRC-S, the Scientific Committee and you for contributing to the conference. Together you have produced a varied and stimulating programme for what should be a great conference.

Professor Peter W. F. Smith

ADRN Director

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# ACKNOWLEDGEMENTS

ADRN2017 is the first of the ADRN's series of annual research conferences to invite active participation from those outside the ADRN, as well as those inside it. ADRN2017 would not have been possible without the following funding from the ESRC, to both the contributing authors and presenters, and the host ADRC-Scotland.

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ESRC grant number ES/L007452/1 (Administrative Data Service)

More information can be found on www.esrc.ac.uk

Sessions from ADRN2017 and ad hoc interviews will be available on the ADRN YouTube channel (Search for ADRNUK on www.youtube.com) Filming and editing has been performed by Being There Media.

We would like to take this opportunity to welcome you to the 4<sup>th</sup> Administrative Data Research Network Conference. The conference has grown in size and diversity each year reflecting the growing importance of administrative data for research with the social and health sciences. We are delighted by the ever broadening range of topics and speakers and hope that the conference will offer an opportunity to both expand your knowledge of administrative data and share your own experiences. Going forward, we now hope this conference will become a key point of reference for those working with administrative data across the globe.

We extend a warm welcome to our keynote speakers Julia Lane, Johan Mackenbach and David Yokum whose contributions will cut across the substantive, policy and methods strands of administrative data research that form the spine of what the ADRN conference is about.

Finally, we would like to make a special mention of Andrew Smith, Amy Tilbrook, Elise Williamson and Lisa Fallon for their fantastic painstaking work in bringing this year's conference to together.

So Welcome, ceud mile fàilte

We wish you an interesting and enjoyable conference and hope to see you again next year in Belfast.

Mark Elliot Chris Dibben Scientific Committee

# Venue Map



# ADRN2017 Key Speakers

# JULIA LANE

Professor of Public Service

Julia Lane is a Professor at the NYU Wagner Graduate School of Public Service, at the NYU Center for Urban Science and Progress, and a NYU Provostial Fellow for Innovation Analytics. Previous to this, Julia was a Senior Managing Economist and Institute Fellow at American Institutes for Research. In this role Julia established the Center for Science of Science and Innovation Policy Program, and co-founded the Institute for Research on Innovation and Science (IRIS) at the University of Michigan. Julia has held positions at the National Science Foundation, The Urban Institute, The World Bank, American University and NORC at the University at Chicago.

In these positions, Julia has led many initiatives, including co-founding the UMETRICS and STAR METRICS programs at the National Science Foundation. She conceptualised and established a data enclave at NORC/University of Chicago. This provides a confidential, protected environment within which authorised researchers can access sensitive microdata remotely and provides data producers with a secure dissemination platform. She also initiated and led the creation and permanent establishment of the Longitudinal Employer-Household Dynamics Program at the U.S. Census Bureau. This program began as a small two year ASA Census Bureau fellowship and evolved into the first large-scale linked employer-employee dataset in the United States. It is now a permanent Census Bureau program with appropriated funds of \$11 million per year.

Julia has published over 70 articles in leading economics journals, and authored or edited ten books. She is an elected fellow of the American Association for the Advancement of Science and a fellow of the American Statistical Association. She has been the recipient of over \$50 million in grants; from foundations such as the National Science Foundation, the Alfred P. Sloan Foundation, the Ewing Marion Kauffman Foundation, the MacArthur Foundation, the Russell Sage Foundation, the Spencer Foundation, the National Institutes of Health; from government agencies such as the Departments of Commerce, Labour, and Health and Human Services in the U.S., the ESRC in the U.K., and the Department of Labour and Statistics New Zealand in New Zealand, as well as from international organisations such as the World Bank. Julia is the recipient of the 2014 Julius Shiskin award and the 2014 Roger Herriot award.

#### Building sustainable accessible data infrastructures: Ideas from the US

The use of data from multiple sources can change the way in which governments do business. The problem is that agencies are often reluctant to face the technical, legal and resource obstacles associated with linking data across agencies. This presentation describes a US approach that addresses the core barriers which underlie agency resistance to sharing data. It creates a sandbox environment that demonstrates the value of linking data to agency staff through active learning techniques within a secure remote access environment. The environment is built around agency needs and uses modular learning approaches. The approach has been quite successful because it (i) creates a pipeline of new prototype products central to agency mission as defined by senior management (ii) develops teams of practitioners who can demonstrate the value of the new types of data for solving real world practical problems and who become embedded in their organizations and (iii) makes new linked data available as an ongoing asset.

# DAVID YOKUM

Director of The Lab @ DC

**David Yokum**, JD, PhD, is Director of The Lab @ DC in the Executive Office of the Mayor of the District of Columbia Government. The Lab @ DC weaves an agile, scientific approach to policy-setting and program operations into the fabric of day-to-day governance. David's team works in the Office of the City Administrator and in partnership with a network of universities and research centres. Under David's direction, they conduct applied research projects to generate timely, relevant, and high-quality evidence that informs the District's most important decisions. They also develop strategies to enhance the government's institutional capacity to use and generate evidence, broadly speaking.

David was previously a founding member of the White House's Social & Behavioral Sciences Team and Director of its scientific delivery unit housed at the U.S. General Services Administration, namely the Office of Evaluation Sciences. President Obama further institutionalized the work in Executive Order 13707, "Using Behavioral Science Insights to Better Serve the American People."

David's expertise draws on the cognitive foundations of judgment and decision making and, in particular, how that knowledge and associated methodologies can be extended into applied settings. His public speaking, teaching, and advocacy won the Excellence in Teaching Award from the University of Arizona (UA) College of Science. His work has been published in journals such as *Health Affairs, Journal of Empirical Legal Studies, American Journal of Law & Medicine,* and *Law & Contemporary Problems* and received media coverage from outlets such as *NPR, The New York Times, The New Yorker, The Wall Street Journal, Slate, USA Today, Politico, Scientific American, Forbes, Huffington Post,* and elsewhere. David earned a PhD in Psychology (with dual specialization in Cognition & Neural Systems and Psychology, Policy, & Law) at UA, a law degree from the UA James E. Rogers College of Law, a Master's degree in Bioethics & Medical Humanities from the University of South Florida, and a BS in Biology from Birmingham-Southern College. He lives in DC with his wife Sara, son Ethan, dog Tieto, cats Philo and Mouse, and bunny Mr. Bubbles.

# The politics of unlocking data: insights from the front lines of government

Substantial progress has been made on the technical components of collecting, sharing, and analyzing data. Examples of enhanced profits and welfare benefits are everywhere. Yet many organizations still struggle to unlock and use their data. This is true inside government, for example, where vast stores of administrative data go unlinked and unanalyzed. Why? The usual suspects of budgetary constraints and privacy laws are not sufficient explanations. Drawing on experiences founding the White House's Social and Behavioral Sciences Team and The Lab @ DC in the Executive Office of the Mayor in the U.S. District of Columbia, this talk goes further, exploring the politics and especially the psychology behind decisions to liberate and use—or not—government data.

# JOHAN MACKENBACH

Professor of Public Health

**Johan Mackenbach** is Professor of Public Health and chair of the Department of Public Health at the Erasmus MC, University Medical Center Rotterdam, the Netherlands.

He was trained as a medical doctor, and specialised in public health and epidemiology. His research interests are in social epidemiology, medical demography and health policy. He (co-)authored more than 600 papers in international, peer-reviewed scientific journals, as well as a number of books. He is also a former editor-in-chief of the European Journal of Public Health. He is a member of the Royal Netherlands Academy of Arts and Sciences and of the Academia Europaea, honorary professor at the London School of Hygiene and Tropical Medicine, and Honorary Fellow of the Faculty of Public Health of the Royal Colleges of Physicians of the United Kingdom. In March 2015 he received the degree of *Doctor Honoris Causa* at the Université catholique de Louvain (Belgium).

# Health inequalities in Europe. New insights from comparative studies

Socioeconomic inequalities in mortality are present in all European countries, but their magnitude and development over time is highly variable. In a series of on-going comparative studies we exploit these variations to identify the macro- and micro-level determinants of these mortality inequalities. In my presentation I will summarize the results of these studies, and relate our findings to current insights into the explanation of health inequalities in modern welfare states."

# CALLS-HUB

The Census & Administrative data LongitudinaL Studies Hub (CALLS-Hub) has been commissioned by the ESRC to co-ordinate, harmonise and promote the work of the three Longitudinal Study Research Support Units in the UK, with the aim of providing a more streamlined experience for users.

The Longitudinal Study Research Support Units are: The Centre for Longitudinal Study Information & User Support (CeLSIUS), The Scottish Longitudinal Study Development & Support Unit (SLS-DSU) and The Northern Ireland LongitudinaL Study Research Support Unit (NILS-RSU). The census Longitudinal Studies provide a unique and powerful research resource for a diverse range of academic disciplines, in addition to forming a powerful source of research evidence for policy-makers, practitioners and third sector bodies. A list of outputs from the studies so far is available on the CALLS-Hub website.

CALLS-Hub is a collaboration between the University of St Andrews, University of Edinburgh, and University College London, though the management group also includes the directors of CeLSIUS, SLS-DSU and NILS-RSU. It exists to help users and potential users find the information and resources they need in a straightforward way, and promote the work and impact of the RSU's to a wider audience.

Find out more on the CALLS-Hub website at www.calls.ac.uk



# Competence Centre of Microeconomic Evaluation (CC-ME)

**Mission**: The CC-ME is part of the Joint Research Centre (JRC) for the European Commission's science and knowledge service. The CC-ME aims to enhance the EU policy process through ex-post causal evaluation and data-driven microeconomic analysis.

**Services**: The Competence Centre on Microeconomic Evaluation serves as a focal point of reference to support policy-making across a wide range of areas of impact evaluation of EU policies, by providing advice on data collection and evaluation design, capacity building on counterfactual methods, microeconometric analysis and counterfactual impact evaluation. It also provides infrastructure for evaluation knowledge management, in the form of a (Micro) Data Bank and an Evaluations Bank.

**Data and methods**: The Competence Centre on Microeconomic Evaluation contributes to ensure that both appropriate counterfactual methods and micro-data sources are used in a systematic way across the Commission policy cycle.

**Focus**: Quantitative evaluation of EU policies across a variety of socio-economic outcomes could greatly contribute to the Better Regulation Agenda, the European Semester and the targeting of the European Structural Investment Funds.

Challenges on the use of administrative data for counterfactual impact assessment in Europe -Roundtable

Nuno Crato<sup>12</sup>, Paul Jackson<sup>34</sup>, Sven Langedijk<sup>1</sup>, Joachim Möller<sup>56</sup>, Giulia Santangelo<sup>1</sup>

<sup>1</sup>EC-JRC; <sup>2</sup>University of Lisbon; <sup>3</sup>ADRN; <sup>4</sup>University of Essex; <sup>5</sup>Institute for Employment Research, IAB; <sup>6</sup>University of Regensburg

Policy measures impact can be quantitatively assessed and evaluated provided appropriate statistical methods are used. The success of these methods depends crucially on the existence of microdata able to provide information on the evolution of the units under consideration. We know that administrative data have various advantages for this purpose. This link between administrative data availability and the proper evaluation of public policies, however, has yet to be incorporated in the regular policy cycle and should start to be a normal fact of life for modern societies. Following a collective study on these points, we will discuss a couple of European and non-European experiences and debate some challenges that are still ahead of us.

# ADRN2017 PROGRAMME

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09:00am – 10:00am	Registration Thursday 1 June 2017
10:00am - 10:15am	Welcome to ADRN2017 - Wolfson Hall (Chris Dibben & Mark Elliott)
10:15am - 11:05am	Johan Mackenbach: Health inequalities in Europe. New insights from comparative studies - WOLFSON HALL  Quincentenary
11:05am - 11:30am	Coffee Break - Playfair Hall
11:30am - 12:10pm - Parallel Session 1	Session 1A The research use of data: the impact of new legislation Session 1B Applied statistics Session 1C Health service development I Session 1D Safe sharing and linkage Session 1F Educational attainment Session 1G Premature mortality – CALLS-HUB
12:20pm - 1:20pm - Parallel Session 2	Session 2A Public engagement and value of admin data Session 2B Maternal and child health Session 2C The opportunity of census data Session 2D Identifiers in admin data Session 2F Data quality Session 2G Health inequalities I - CALLS-HUB
1:20pm - 2:20pm	Lunch and Posters - Playfair Hall
2:20pm - 3:10pm	<b>Julia Lane:</b> Building sustainable accessible data infrastructures: Ideas from the US - WOLFSON HALL   Quincentenary
3:10pm - 3:50pm - Parallel Session 3	Session 3A Exploiting admin data to understand crime Session 3B Scottish children Session 3C Evaluating public programmes Session 3D Combining health data Session 3F Health inequalities II Session 3G Internal migration - CALLS-HUB
3:50pm - 4:20pm	Afternoon Break - Playfair Hall
4:20pm - 5:20pm - Parallel Session 4	Session 4A Early years education Session 4B Uses of synthetic data Session 4C Social mobility Session 4D Complex health interactions Session 4F Linkage using addresses/postcodes: issues & solutions Session 4G Health & migration - CALLS-HUB

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# Friday 2 June 2017

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09:00am - 09:50am	David Yokum: "Plenary" - WOLFSON HALL  Quincentenary
9:55am - 10:55am - Parallel Session 5	Session 5A Children in care Session 5B Welfare & changing society Session 5C Education & employment Session 5D Environment & health Session 5F Research data infrastructure I
10:55am - 11:25am	Coffee break - Playfair Hall
11:25am - 12.25pm	JRC Roundtable - WOLFSON HALL   Quincentenary
12:25pm - 1:25pm	Lunch and Posters - Playfair Hall
1:25pm - 2:25pm - Parallel Session 6	Session 6A Maternity & substance abuse Session 6B Healthy ageing Session 6C Research data infrastructure II Session 6D Data linkage I Session 6G Cohort data
2:25pm - 2:55pm	Afternoon Break - Playfair Hall
2:55pm - 3:35pm - Parallel Session 7	Session 7A Geography & deprivation Session 7B Combining admin data with other data Session 7C Social care Session 7D The Scotland/Glasgow effect Session 7G Data linkage II
3:35pm – 3:45pm	Closing Remarks – WOLFSON HALL   Quincentenary

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<b>T</b> 1 11 1		QUINCENTENARY BUILDING				
THU	TJUNE	WOLFSON HALL (upstairs)	GB ONG (gr. floor)	TAUSEND (gr. floor)		
10.00 10.15		Welcomes C.Dibben, M.Elliot PLENARY JOHAN MACKENBACH				
11.05	MID MOR	NING BREAK	REFRE	SHMENTS + Poster display in Playfair Hall		
		1A - Research use of data: impact of new	1B- Applied statistics	1C - Health Service Development		
11.30	SESSION 1	Sharing for research purposes: proposed Digital Economy Bill 2016-17 Ch 5. Pt. 5 and its conformity with legal restrictions on admin data sharing in UK <u>#139 Elaine Mackey</u>	Power calculator for instrumental variable analysis in pharmacoepidemiology <u>#20 Venexia Walker</u>	Evaluating Emergency Department overcrowding at regional level: a study in Lombardy region (Italy) <u>#85 Mazzali Cristina</u>		
		Defining identifiability under the new General Data Protection Regulation: what are the implications for the reuse of data? <u>#34 Stergios Aidinlis</u>	A framework for classifying studies of linked data to facilitate sensitivity and bias analysis for linkage error <u>#81 James Doidge</u>	Outcomes following discharge from Critical Care <u>#118 Angharad Walters</u>		
12.10	TRANSITI	ON BETWEEN PARALLELS				
		2A - Public engagement and value of admin data	2B - Maternal and child health	2C - The opportunity of census data		
12 20	SESSION	Are publics a barrier to administrative data research: An exploration of the public influence on administrative data research in the UK <u>#18 Carol Porteous</u>	Evaluation of maternal diseases and medications recorded in NI Maternity System database compared to NI Enhanced Prescribing Database: a data linkage validation study #19 Maria Loane	Young caregivers differ from older caregivers: a census-based record linkage study <u>#27 Foteini Tseliou</u>		
12.20	2	Beyond the hype: Using story-telling to explore the use of data in local government <u>#112 Emily Rempel</u>	Using linkage of admin data to build a national database for analysis of birth and its outcome in England and Wales #84 Alison Macfarlane	Household change and proximity to death's an analysis using linked administrative records #51 lain Maitland Atherton		
		The black cat in the status quo: the impact of not using administrative data <u>#82 Kerina Jones</u>	Pregnancy Spine's linking siblings in birth registration data <u>#109 Christos Chatzoglou</u>	Selective Religious Migration across the Life course: Evidence from N. Ireland 1981-2011 <u>#87 Brad Francis Campbell</u>		
13.20	LUNCH			LUNCH + Poster display in Playfair Hall		
14.20		PLENARY JULIA LANE				
		3A - Exploiting admin data to understand crime	3B - Scottish children	3C - Evaluating public programmes		
15.10	SESSION 3	Administrative data as a safe way to research hidden domestic violence journeys <u>#22 Janet C. Bowstead</u>	Increasing understanding of children's lives through linking survey and administrative data: the case of the Growing Up in Scotland study <u>#107 Paul Bradshaw</u>	Evaluating the impacts on health outcomes of Welsh Government funded schemes designed to improve the energy efficiency of the homes of low income households <u>#113 Sarah Lowe</u>		
		Using linked admin data to examine the impact of seizure and investigation of illegal drug consignments on local communities <u>#53 Ben Matthews</u>	The Child Mental health in Education (ChiME) Project: a novel cohort study of child mental health in schools using routine data #108 Lucy Thompson	The Supporting People Programme Study: the peaks, troughs and 'in- betweens' of data linkage <u>#116 Rhodri Johnson</u>		
15.50	MID AFTE	RNOON BREAK	REFRE	SHMENTS + Poster display in Playfair Hall		
		4A - Early years education	4B - Uses of synthetic data	4C - Social mobility		
		Trajectories of transition from pre-school to primary school: Analysis using the English National Pupil Database <u>#36 Tammy Campbell</u>	Assessing disclosure risk in spatially referenced synthetic data using automated zone design <u>#39 David Martin</u>	Correlating Social Mobility and Economic Outcomes <u>#142 Jose V. Rodriguez Mora</u>		
16.20	SESSION 4	Welsh Government Flying Start Programme Evaluation Using Linked Data <u>#94 Laura McGinn</u>	Evaluating population data linkage: assessing stability, scalability, resilience, robustness across many data sets for comprehensive linkage evaluation <u>#120 Tom Dalton</u>	Linked datasets to model occupational mobility in Britain <u>#117 Glenna Nightingale</u>		
		Flying Start Evaluation: Educational Outcomes <u>#10 Joseph Wilton</u>	Systematically corrupting data to assess data linkage quality <u>#101 Ahmad Alsadeeqi</u>	Why do escalator regions increase upward social mobility? Linkage of 1947 Scottish Mental Survey with Scottish Longitudinal Study and Census data <u>#25 Lynne Forrest</u>		
18.00	SOCIAL EVENING - ACCESS TO SURGEONS' HALLS MUSEUMS - CONFERENCE DINNER AT 19.30					

QUINCENTENARY	PRINCE PHILIP BUILDING				
WADSWORTH (gr. floor)	CHARTER SUITE (gr. floor)	DEACON'S SUITE (upstairs)	PLAYFAIR HALL (up)	THU 1 S	JUNE
				PLENARY	10.00
MID MORNING BREAK		REFRESHMENTS + P	oster display		10.15
1D - Safe sharing and linkage	1F - Educational attainment	1G - CALLS-HUB: Premature			
Connecting Castles Securely #35 Simon Thompson	The educational impacts of income supplements to deprived children and families #74 Ben Matthews	mortality Incidence of conditions considered amenable to health care in Scotland <u>#119 Megan Yates</u>		SESSION	11 30
The DASSL Model - Safe Sharing and Linkage of Data - Reflections one year on <u>#102</u> <u>Rosalyn Moran</u>	Impact on pupil educational attainment due to individual or family health using linked data #128 James Healy	Comparison of under-5 mortality in England and in Sweden using electronic birth cohorts from admin. linked data <u>#133 Ania Zylbersztejn</u>		1	11.50
TRANSITION BETWEEN PARALLE	LS			1	12.10
2D - Identifiers in admin data	2F - Data quality	2G - CALLS-HUB: Health inequalities			
Identifying Families in Welsh Administrative Data <u>#31 Robert French</u>	Guidance for Measuring and Reporting on Quality when Administrative Data is used to Supplement or Replace Survey Data <u>#13 Daisy Hamer</u>	Long term illness and reported mental health conditions during recession: exploring evidence from the Scottish Longitudinal Study <u>#99 Sarah Curtis</u>	POSTER DISPLAY		
An Identifier Scheme for the Digitising Scotland Project <u>#110 Alasdair Gray</u>	Monitoring survey measurement error over the course of data collection: do late respondents give more inaccurate answers? #69 Jamie Moore	Mortality and ethnicity: minorities fare better than the White Scottish majority in the Scottish Health and Ethnicity Linkage Study (SHELS) #71 Genevieve Cezard		SESSION 2	12.20
Persistently identifying administrative data: should we care? <u>#135 Dr Kakia Chatsiou</u>	Quality Assuring Linked Birth Registration and Hospital Episode Statistics Delivery Records's results and lessons learned #104 Gill Harper	Profiling, benchmarking and exploring Age-Period-Cohort patterns in mortality in the Affluent World: examples from Scotland and beyond #30 Jonathan Minton			47.00
		LUNCH + P	oster display		15.20
				PLENARY	14.20
3D - Combining health data How to pool pseudonymized claims data from 6 European countries' healthcare systems <u>#130 Florian Endel</u>	3F - Health inequalities II How do trends in different measures of mortality inequalities in Scotland and England & Wales compare? #2 Gerry McCartney	3G - CALLS-HUB: Internal migration How can we better understand internal migration? #122 Annemarie Ernsten	POSTER	SESSION	15.10
GP practices differences in COPD care in Hampshire <u>#136 Sharon X Lin</u>	Mortality among young people diagnosed with type 1 diabetes in Wales (BRECON Cohort)- do health inequalities play a role? <u>#11 Diana Wasag</u>	Measuring Internal Migration: Comparing Census and Administrative Data <u>#41 Brian Foley</u>		5	
AD Complexity III		REFRESHMENTS + P	oster display		15.50
4D - Complex health interactions Me-D-Links: metformin for diabetes in pregnancy: an analysis of health and education outcomes using linked administrative data #79 Joanne Given	4F - Linkage by addresses/ postcodes Creating a postcode history from medical sources for longitudinal analyses #47 Dawn Everington	4G - CALLS-HUB: Health & migration All-cause mortality by income level in working-age migrants and the majority settled population of Finland: a follow-up from 2001 to 2014 #5 Anne Kouvonen			
#50 Association between area based social deprivation index and survival in out of hospital cardiac arrest patients across Scotland <u>#50 Nynke Halbesma</u> Health consequences of young	I ne geographical and temporal variation of sold property prices using linked council tax valuations as a baseline <u>#126 Chris Gale</u> Investigating address accuracy	The move, the person, or the area? Exploring risk of Cardiovascular Disease in New Zealand <u>#15 Frances Darlington-Pollock</u> How well does registry data answer	POSTER DISPLAY	SESSION 4	16.20
people not in employment. education or training: analysis of mortality risk in Scotland <u>#44 Zhiqiang Feng</u>	in a key administrative data source <u>#40 Brian Foley</u>	questions about migrant mental health? An analysis of author concerns from a scoping review <u>#88 Kishan Patel</u>			10.00

2 JUNE		WOLFSON HALL	GB ONG	TAUSEND	WADSWORTH	DEACON'S SUITE	
09.00 PLENARY DAVID YOKUM - WOLFSON HALL							
		EA. Children in some	5B - Welfare & changing	5C - Education &		5G - Research data	
		5A - Children in care	society	employment	5D - Environment & health	infrastructure I	
		Lifetime experiences of	Using longitudinal	Inequalities in school	A sibling study of whether		
		care among children in	administrative data on	leavers' labour market	maternal exposure to	National Records of	
		England: analysis of	employment history to	outcomes: do school	different types of natural	Scotland's Trusted Third	
		administrative social care	identify poverty risks and	subject choices	space is related to birth	Party Indexing Service	
		data #96 Louise Mc Croth Long	social need	matter? #E4 Cristina Janualli	Weight #77 Elizabeth Bichardson	#42 David Clark	
		A national demonstration	<u>#97 Serena Pallaro</u>	#54 Cristina lannetti	#77 Elizabeth Richardson		
		project to link routinely	A pilot ADRC-NI project				
		collected social work and	linking Social Security	Using administrative	Forests, health and		
	N 5	dental health data to	Benefits to understand	data in education	inequalities in Scotland: a	Prioritising dataset	
09.50	Q	investigate and enable	the health and social	research and	longitudinal analysis using	acquisition for large-scale	
	ESS	monitoring of the health	needs of disability	and value	linked administrative data	#92 Karen Tingay	
	S	and healthcare of looked	benefit claimants	#28 Laura da Costà	#24 Jennifer Thomson	<u>"SE Raren Hingay</u>	
		after children in Scotland	#111 Aideen Maguire				
		#125 Alex McMahon				Maritaria (viales af) arment	
		Discoment stability of	The 'aut' of each aut and	Detention and		Monitoring (risks of) survey	
		children in out of home	study construction in	Retention and	Air pollution and cognitive	during data collection:	
		care in Scotland: A	administrative datasets:	Learners in Sixth Form	pilot studies of methods and	Can collection be ended	
		Sequence Analysis	examples from Scotland	Schools	data linkage	early without impacting on	
		#12 Chris Playford	#160 Lee Williamson	#45 Rhys Davies	#100 Ai Milojevic	dataset quality?	
						#68 Gabriele Durrant	
10.55	MIE	D MORNING BREAK			REFRESHMENTS +	Poster display in Playfair Hall	
11.25		NCH	PLENARY EU Joint F	lesearch Centre ROUND	TABLE - WOLFSON HALL	Poster display in Playfair Hall	
12.25		6A - Maternity & substance		6C - Research data			
		abuse	6B - Healthy ageing	infrastructure II	6D - Data linkage I	6G - Cohort data	
		Maternal mortality and		The Hampshire Health		Alcohol outlet density and	
		substance use during	Social factors influencing	Record Analytical		hospital admissions for	
		pregnancy: analysis of	uptake of free eye	Database: Approaches	A new scaling approach to	alcohol-related injury: an	
		England (2002, 2014)	examinations in Northern	to the Analysis of	record linkage	electronic record-linked	
		#49 Ruth Marion	#115 David Wright	Health Data		cohort study	
		Blackburn	<u></u>	#1 Matt Johnson		<u>#105 Sarah Rodgers</u>	
		A case cross over study of	Childhood cognitive	UK Secure eResearch		Linking cohort data and	
		neighbourhood alcohol	function and later-life	Platform - A	Applying machine learning to	routinely collected health	
	9	retail outlet density and	economic activity:	Dementias Platform	improve the accuracy of	data to enhance	
13.25	N	maternal drinking	Linking the Scottish	UK Data Portal Case	probabilistic linkage	investigations into	
	SSIC	behaviours during	Mental Survey 1947 to	Study	#124 Marcos Ennes Barreto	childhood obesity, asthma,	
	SE	#46.Jamie Pearce	#55 Matthew H lyeson	<u>#137 Christopher</u> Orton		#106 Karen Tingay	
						Emotional and behavioral	
				Sat the Controls for		difficulties in early	
			Healthy Ageing in	Planet Jupytor:		childhood and risk of	
		Opportunities for tobacco	Scotland (HAGIS):	Reproducible	Future vision for data	injury in early adolescence:	
		research using Scotland's	Sample Design and	Research and Literate	integration	A longitudinal data linkage	
		maternity records	Health-Related Response	Administrative Social	#121 Becky Tinsley	study using linked cohort	
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# The Hampshire Health Record Analytical Database: Approaches to the Analysis of Linked Administrative Health Data

#### Matt Johnson

NIHR CLAHRC Wessex Methodological Hub, Faculty of Health Sciences, University of Southampton

When analysing health or social care data for research or commissioning purposes, we often consider our topic of interest from the perspective of one sector alone. There are many reasons for this, not least the often limited availability of data from multiple sectors. However, it is also true that no single element of the health and social care system exists in isolation, so to progress from simply describing its individual parts to understanding the whole system, it is essential that we adopt a standard working practice which considers all elements together.

This is possible in Hampshire by way of the Hampshire Health Record Analytical Database; a patient-centric anonymised linked database bridging different sectors of the local health and social care system. Principally comprised of clinical data from the Hampshire Health Record shared electronic care record and augmented with administrative data from local and national sources, the database links health and demographic data, with an extension to include social care data anticipated in the near future.

With coverage of approximately 75% of the Hampshire population (or  $\sim$ 1.4 million patients), the database enables cross-sector analysis at patient and population level, generating opportunities for research into the clinical, social, demographic and small area determinants of health. Having successfully used this data source for a variety of research studies, we will discuss some of the technical and methodological approaches to data linkage and analysis in health, and present some worked examples of their uses and benefits.

# How do trends in different measures of mortality inequalities in Scotland and England & Wales compare?

Gerry McCartney<sup>1</sup>, Frank Popham<sup>2</sup>, Srinivasa Vittal Katikireddi<sup>2</sup>, David Walsh<sup>3</sup>, Lauren Schofield<sup>4</sup>

<sup>1</sup>NHS Health Scotland; <sup>2</sup>MRC/CSO Social and Public Health Sciences Unit; <sup>3</sup>Glasgow Centre for Population Health; <sup>4</sup>Information Services Division, NHS National Services Scotland

# Background

The recent publication of trends in mortality inequalities by educational attainment for Scotland and England & Wales (E&W) suggested that there have been substantial declines in absolute inequalities between the mid-1990s and mid-2000s. This paper compares these trends with those using area deprivation as a marker of socio-economic position from the early 1980s.

# Methods

We calculated the Slope Index of Inequality (SII) and Relative Index of Inequality (RII) for all-cause mortality for men and women aged 35-79 years, separately for Scotland and E&W, around the census years of 1981, 1991, 2001 and 2011. We used the Carstairs deprivation index to rank the population according to area of residence.

# Results

Relative inequalities in mortality by area deprivation have consistently increased for men and women in Scotland and E&W between 1981-3 and 2010-2. Absolute inequalities increased for men and women in Scotland, and for women in E&W, between 1981-3 and 2000-2 before subsequently falling. For men in E&W absolute inequalities were more stable until 2000-2 before a subsequent decline. Both absolute and relative inequalities were consistently higher in men and in Scotland. These trends contrast markedly with the reported declines in mortality inequalities by educational attainment and apparent improvement of Scotland's inequalities with those in E&W.

# Conclusion

Trends in health inequalities differ when assessed using different measures of socioeconomic position, reflecting either genuinely variable trends in relation to different aspects of social stratification or varying error or bias. There are particular issues with the educational attainment data in Great Britain prior to 2001 that make these education-based estimates less certain.

# Set the Controls for Planet Jupyter: Reproducible Research and Literate Administrative Social Science Data Analysis

Vernon Gayle<sup>1</sup>, Christopher Playford<sup>1</sup>, Roxanne Connelly<sup>2</sup>, Alasdair Gray<sup>3</sup>

<sup>1</sup>ADRC-Scotland; <sup>2</sup>University of Warwick; <sup>3</sup>Heriot-Watt University

The known universe of data that are available to social science researchers is ever expanding, and the second decade of the 21st Century is characterised by the explosion of new forms of information, in particular administrative data. The increased processing speed of computers and the expansion of affordable storage capacity present exciting opportunities for social science research. The result is that empirical studies in social science disciplines are likely to become increasingly computationally intensive. Because of these rapid changes in both the data and the computational landscape we conjecture that social scientists need to re-think aspects of the research process.

This presentation draws on a collaboration within the Administrative Data Research Centre - Scotland bringing together social scientists and computer scientists with expertise in e-research and data science to develop a framework and tools to provide improved workflows in the analysis of administrative social science data. The focus of the paper is 'literate computing', which involves the weaving of research narratives directly into live computation, interleaving text and documentation with research code and results to construct complete and transparent workflows with the goal of communicating social science results.

The presentation will concentrate on four inter-related aspects of the workflow – accuracy, programing efficiency, transparency and reproducibility. We will demonstrate how Jupyter notebooks can be used to assist in currently underexplored areas such as research code sharing, producing rich visual outputs, markdown and documentation, version control, portability, undertaking language agnostic data analysis, and leveraging 'big data' tools for administrative social science data analysis.

# All-cause mortality by income level in working-age migrants and the majority settled population of Finland: a follow-up from 2001 to 2014

Anne Kouvonen<sup>12</sup>, Kishan Patel<sup>2</sup>, Aki Koskinen<sup>3</sup>, Lauri Kokkinen<sup>4</sup>, Michael Donnelly<sup>2</sup>, Dermot O'Reilly<sup>2</sup>, Ari Vaananen<sup>3</sup>

<sup>1</sup>University of Helsinki; <sup>2</sup>ADRC-NI; Queen's University Belfast; <sup>3</sup>Finnish Institute of Occupational Health; <sup>4</sup>University of Tampere

### Background

In most studies migrants seem to display a survival advantage over the settled population, but the relationship with income is as yet unknown. The aim of this record-linkage study was to explore the relationship between income and the risk of mortality between the settled majority population and different migrant groups.

### Methods

A random sample of 1,058,381 working age people (age range 18 to 64 years) living in Finland in 2000 were drawn from the Finnish Population Register, and linked to mortality data from 2001 to 2014 obtained from the National Death Register. Records were linked by national, personal ID numbers. We formed five different regions of birth: Finland; Russia or USSR; Eastern Europe and the Balkans; Western Europe and other Western countries; and Africa, Middle East and Asia. We assigned each person to one of two income classes, 'high' or 'low' income, calculated from the median income (from work and benefits) of the entire cohort in 2001. Cox proportional hazard models were used to investigate the association between migrant status and all-cause mortality.

### Results

After adjustment for age, sex, marital status, and employment status, the risk of mortality was significantly reduced for low-income migrants when compared to the majority Finnish population (hazard ratio, 0.46 (95% CI 0.42-0.50)). Results comparing high-income groups were not statistically significant. Low-income migrants from Africa, the Middle East and Asia had the lowest mortality risk of any group studied (hazard ratio, 0.32 (95% CI 0.27-0.39)).

#### Conclusion

Particularly low-income migrants seem to display a survival advantage when compared to the corresponding income group in the settled majority. We suggest that downward social mobility, differences in health-related lifestyles, and healthy migrant effect may explain this phenomenon.

# Maintaining social care provision in the context of financial austerity

Stephen Jarvis<sup>1</sup>, Sarunkorn Chotvijit<sup>2</sup>, Malkiat Thiarai<sup>2</sup>

<sup>1</sup>Department of Computer Science, Unversity of Warwick; <sup>2</sup>University of Warwick

There is significant national interest in tackling issues surrounding the needs of vulnerable children and adults. At the same time, UK cities are under significant financial strain, as local government financial settlements (the distribution of central government resources) decrease in real terms and yet urban populations, which draw on local government services, continue to grow. This study focusses on the city of Birmingham, the UK's largest and most populous city outside of London.

In a data-led study, using administrative data derived from personal social care records, we analyse the management and delivery of social care services by Birmingham City Council, which itself is the largest local authority in Europe. This research employs state-of-the-art data analytic techniques to analyse six years of Birmingham City Council social care data, in order to identify: (i) Service cost profiles over time; (ii) Geographic dimensions to service demand and delivery; (iii) Patterns in the provision of services, which may assist with future service planning and provision, and (iv) The extent to which method of data value and data protection interact.

# Privacy Preserving Record Linkage in the Presence of Missing Values

Yuan Chi<sup>1</sup>, Jun Hong<sup>2</sup>, Anna Jurek<sup>1</sup>, Weiru Lie<sup>3</sup>, Dermot O'Reilly<sup>4</sup>

<sup>1</sup>School of Electrical Engineering and Computer Science, Queen's University Belfast; <sup>2</sup>Department of Computer Science and Creative Technologies, University of the West of England, Bristol;<sup>3</sup>Merchant Venturers School of Engineering, University of Bristol; <sup>4</sup>Centre for Public Health, Queen's University Belfast

The problem of record linkage is to identify records from two datasets, which refer to the same entities (e.g. patients). A particular issue of record linkage is the presence of missing values in records, which has not been fully addressed. Another issue is how privacy and con dentiality can be preserved in the process of record linkage. In this paper, we propose an approach for privacy preserving record linkage in the presence of missing values. For any missing value in a record, our approach imputes the similarity measure between the missing value and the value of the corresponding eld in any of the possible matching records from another dataset. We use the k-NNs (k Nearest Neighbours in the same dataset) of the record with the missing value and their distances to the record for similarity imputation. For privacy preservation, our approach uses the Bloom filter protocol in the settings of both standard privacy preserving record linkage without missing values and privacy preserving record linkage with different rates of missing values. Our experimental results show the effectiveness and efficiency of our proposed approach.

# Flying Start Evaluation: Educational Outcomes

Joseph Wilton<sup>1</sup>, Rhys Davies<sup>2</sup>

<sup>1</sup>Welsh Government; <sup>2</sup>ADRC - Wales

The evaluation was of the educational outcomes for children up to the age of seven with the purpose gaining an insight into if children living in Flying Start areas have improved outcomes relative to those who were not living in a Flying Start area. The research involved detailed analysis of existing datasets, primarily the National Pupil Database (NPD).

The methods relied on multi-level regression models and propensity score matching to determine which factors had the strongest association with the educational outcomes of children up to the age of seven.

Once Flying Start was introduced, the school attendance improved more quickly in Flying Start areas, relative to other areas, and are more likely to be identified as having Special Educational Needs at an earlier age. Improvements in attendance had an indirect effect, leading to greater likelihood of children meeting the expected levels at the end of the Foundation Phase. However, it is currently not possible to determine if living in a Flying Start areas is associated with a direct improvement in educational attainment at age seven, due to the change from Key Stage 1 to Foundation Phase in 2012.

While this evaluation made every attempt to account for wider issues and challenges in the analysis. The factors that have impacted the analysis were that the data is only available on where the child was living while in school. This does not say what, if any, support they received from Flying Start services. Also, there is no data available on the household characteristics of the children included in this analysis, and so their person situations, such as deprivation or family, could not be controlled for.

# Mortality among young people diagnosed with type 1 diabetes in Wales (BRECON Cohort)- do health inequalities play a role?

Diana Wasag<sup>1</sup>, Colin Dayan<sup>1</sup>, John Gregory<sup>2</sup>, John Harvey<sup>3</sup>

<sup>1</sup>Department of Experimental and Molecular Medicine, Cardiff University; <sup>2</sup>Division of Population Medicine, Cardiff University; <sup>3</sup>Wrexham Academic Unit Bangor University

Background and aims: The aim of this study was to examine mortality rates and socio-economic risk factors for premature mortality among patients diagnosed with type 1 diabetes before their 15th birthday in Wales.

Methods: The BRECON childhood onset type 1 diabetes registry (n=3642), with diagnosis from 1981 to 2015 (capturing 98% of all new cases from 1995), was used to investigate patterns in cause-specific mortality. 42801 patient-years of diabetes were analysed and 30 deaths were identified. Follow-up has been defined as time from diagnosis until date of death, time an individual has moved away from Wales or date of censoring (25th July 2015), whichever occurred first. 7.7% of our cohort was lost to follow-up due to emigration. The observed number of deaths was compared with number of deaths seen among different age groups in England and Wales, as reported by Office of National Statistics. Poisson regression was used to compare mortality by socio-economic status, family history of diabetes, age at diagnosis, size of centre involved in diabetic care and gender.

Results: The overall standardised mortality ratio (SMR) between ages 1 to 30 was 2.95 times higher (SMR 2.95 95% CI 1.99-4.21) in comparison to the same agegroup mortality, with mortality significantly higher from the age 15-30. The SMR was 3.45 (2.33-4.92) relative to England. There were more deaths in males than females (22 vrs 9) The incidence rate ratio for females was 0.40 (95% CI 0.19-0.87; P=0.020). Age at diagnosis of diabetes predicted mortality in this cohort: incidence rate ratio (IRR) per additional year of age 1.13 (1.03-1.24) p=0.007. There was no statistically significant association of mortality with socio-economic status, parental history of diabetes or size of centre involved in diabetes care.

Conclusions: Despite advances in diabetic treatment, type 1 diabetes is still associated with higher mortality rates.

# Placement stability of children in out of home care in Scotland: A Sequence Analysis

Christopher James Playford, Janice McGhee, Chris Dibben

### University of Edinburgh

Local authorities in Scotland have a responsibility to provide support for vulnerable children and young people, known as 'looked after children'. A large proportion of these children are looked after away from home, and may be cared for by foster parents, friends or relatives (e.g. a kinship placement), or in a residential unit or school. There have been growing policy and political concerns in Scotland that children placed in such out of home care may have to experience a number of moves between placements before a stable home environment is established for them. The experience of this instability may have a negative impact on these children's wellbeing and on important outcomes such as educational attainment.

This research aims to contribute to our understanding of the patterns of instability which children looked after away from home experience. Policy developments in Scotland have aimed to reduce the amount of instability which children experience in 'out of home care'. This project examines whether there has been a reduction in the instability experienced by these children over recent years through a detailed analysis of the longitudinal sequences of placements which looked after children in Scotland experience. We also investigate the extent to which different patterns of placements are associated with children's school attendance and school exclusions.

# Guidance for Measuring and Reporting on Quality when Administrative Data is used to Supplement or Replace Survey Data

Daisy Hamer

Office for National Statistics

National Statistical Institutes are increasingly using administrative data for statistical purposes, often replacing survey questions or whole surveys with such data. Because of this, it is important that statistical producers understand the quality of the administrative data they use and how to report this quality information to the users. The Quality Centre at the Office for National Statistics (ONS) has developed guidance for measuring and reporting on quality when administrative is used to supplement or replace survey data. This was developed from a literature review of international research as well as case studies from within ONS that looked at quality changes when moving from a survey to an administrative data source. The guidance highlights quality issues to consider before the data are used and throughout the process of producing an output, as well as how to report quality information to the users. Most of the issues fell inside the of the scope of the European Statistical System (ESS) quality dimension but some fell outside of it. These issues were separated into sections of things to consider before the data are used and throughout the process of producing an output, these considerations formed the first section of the guidance. The second section of the guidance focused on how to report the quality information that has been found to users. This paper will summarise the process of developing the guidance and describe how it works.

# The move, the person, or the area? Exploring risk of Cardiovascular Disease in New Zealand

Frances Darlington-Pollock<sup>1</sup>, Dan Exeter<sup>2</sup>, Paul Norman<sup>3</sup>, Nichola Shackelton<sup>2</sup>

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The relationship between migration and health is a burgeoning field of research. In particular, research has examined the influence of health-selective migration on health inequalities, finding that migration between areas can contribute to widening health inequalities in the population. However, much of this research focusses on subjective measures of self-assessed health, masks differences between ethnic groups, and is unable to account for the sequencing of health events and migration or residential mobility events. This paper addresses these limitations, presenting a body of work examining the relationship between residential mobility, cardiovascular disease (CVD), experience of deprivation (change) and ethnicity in New Zealand. Using linked nationally held routine health data, it is possible to determine the sequencing of health events and migration events and examine differences in risk of CVD for movers compared to stayers stratified by ethnicity.

First, the paper examines the association between 'mobility' status (movers versus stayers) and risk of CVD by ethnic group using logistic regression. Second, cox proportional regression is used to compare the risk of CVD for movers who move before their first CVD event with stayers: this accounts for the sequencing of the health and migration events. Finally, sequence analysis is used to evaluate the extent to which risk of CVD varies between mobile groups depending on their deprivation trajectory.

# Exploring the 'Scottish Excess' with eDatashield and linkage of an adjusted Index of Multiple Deprivation

William Ball, Richard Kyle, Iain Atherton

### Edinburgh Napier University

### Background

Scotland has worse health outcomes compared to England and Wales. Not all of this variation can be explained by deprivation and it may explain less now than in the past[1]. However, much of this analysis has relied on outdated measures of deprivation. Directly comparing data from the constituent countries of the United Kingdom is also difficult due to differences in the way Indices of Multiple Deprivation (IMD) are constructed in each country. This study addresses the methodological limitation of current research by linking routinely collected data from England/Wales and Scotland with an adjusted UK Index of Multiple Deprivation (IMD)[2] to conduct joint analysis with an up to date and directly comparable measure of deprivation.

### Methods

An adjusted UK IMD has been developed using two comparably measured domains from the English and Scottish IMDs. This will be linked to individual level census data from both the ONS Longitudinal Study (ONS LS) and the Scottish Longitudinal Study (SLS) to provide a consistent measure of area deprivation. Confidentiality and disclosure control prevent combined analysis of these longitudinal datasets. However, the eDatashield process[3] enables pooled analysis by passing summary statistics between studies to ensure that the datasets are comparable and analysis is equivalent to working with individual level data.

Descriptive and correlational analyses will explore the presence and extent of health inequalities within and between Scottish, English and Welsh populations. If a 'Scottish excess' is discerned, logistic regression will be used to establish how much of this variation can be accounted for by deprivation, adjusting for individual and household socio-economic indicators.

# Discussion

Pooled analysis of individual level census data from England, Wales and Scotland linked to an adjusted UK IMD provides a novel approach to exploring inequalities across the UK. This paper sets out the study and shares preliminary findings.

3. Raab G, Ralston K, Cox F (2013) eDatashield Protocol. Scottish Longitudinal Study: Edinburgh

<sup>1.</sup> Schofield L, et al (2016) Dying younger in Scotland: trends in mortality and deprivation relative to England and Wales, 1981-2011. Health and Place 40

<sup>2.</sup> Abel G, Barclay M, Payne R (2016) Adjusted indices of multiple deprivation to enable comparisons between constituent countries of the UK including and illustration using mortality rates. BMJ Open 6:11

# Are publics a barrier to administrative data research: An exploration of the public influence on administrative data research in the UK

Carol Porteous, Leslie Stevens

### University of Edinburgh

### Introduction

In the United Kingdom data acquisition proves to be challenging for researchers and a culture of caution seems to persist, with data controllers appearing resistant to data release. Publics are anecdotally cited as a barrier to administrative data release and use in the UK but are the public truly a discernible barrier? If the public are not a barrier, then what are the barriers to data release and use in the UK? And how are publics influencing administrative data research? Given the increasing interest in public acceptability and perceptions of the use of administrative data in research, and in light of recent highly publicized controversies relating to secondary uses of data, understanding the views of the stakeholders involved in administrative data research is vital for ensuring that research proceeds in ways which reflect public interests.

# Method

This paper reports on a programme of research activities exploring the views of researchers, publics and data controllers regarding the release and use of administrative data in research. This includes interviews with researchers, deliberative work with the ADRC-Scotland public panel, public events and workshops with data controllers.

# Discussion

Our research examines the various barriers to data acquisition and administrative data research, which are often erroneously attributed to public concerns and ways public(s) views are conceptualized and understood. It is clear that while some publics may disagree or be reticent about their data being used in research, our evidence suggests that publics may indeed be facilitating data use and research.

# Conclusion

In bringing the tensions in understandings to the fore our research highlights the importance of understanding stakeholder perspectives in order to ensure that data flows continue and publicly beneficial research can be pursued. Moreover, greater theorization and deliberation of the role of the publics in social science administrative data research would be helpful to pursue a common understanding of what this means, how publics views can be incorporated and how public benefits can be realized and maximized.

# Evaluation of maternal diseases and medications recorded in Northern Ireland Maternity System (NIMATS) database compared to NI Enhanced Prescribing Database (EPD): a data linkage validation study

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<sup>1</sup>Institute of Nursing and Health Research, Ulster University; <sup>2</sup>ADRC-Northern Ireland; Ulster University

The effects of medication exposure during pregnancy on the unborn child are largely unknown, as pregnant women are excluded from pre-marketing clinical trials assessing drug safety. The use of existing administrative datasets, holding routinely collected patient health records, may be feasible for conducting medication safety studies on pregnant women to investigate the risks/consequences of in utero medication exposure on birth outcomes and later child development outcomes. However, these administrative datasets require assessment of data quality to ensure that the data are suitable for research as they were not developed for this purpose. The aim of this study is to evaluate the quality of maternal diseases and medications data recorded in the Northern Ireland Maternity System (NIMATS) database compared to the NI Enhanced Prescribing Database (EPD).

NIMATS data for all mothers resident and giving birth in NI will be linked to EPD data using the mother's Health Care Registration Number (HCN) as a unique patient identifier. Agreement between the two data sources and sensitivity/ specificity estimates will be calculated for each therapeutic class of medications. Self-reported maternal diseases recorded in NIMATS will also be cross-validated with dispensed prescriptions recorded in EPD to assess completeness, consistency and accuracy of information.

Awareness of the quality of NIMATS medication and maternal diseases data is essential if these data are to be used in data linkage studies assessing medication safety in pregnancy. These findings will inform a larger ADRN NI/ UK-wide data linkage study exploring child developmental and educational outcomes following maternal medication exposure during pregnancy.

# Power calculator for instrumental variable analysis in pharmacoepidemiology

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<sup>1</sup>School of Social and Community Medicine, University of Bristol; <sup>2</sup>MRC University of Bristol Integrative Epidemiology Unit; <sup>3</sup>Department of Economics, University of Bristol; <sup>4</sup>Department of Public Health and Primary Care, University of Cambridge

Background: Instrumental variable analysis, for example with physicians' prescribing preferences as an instrument for medications issued in primary care, is an increasingly popular method in pharmacoepidemiology. This is particularly true as the use of administrative data that details prescriptions, such as that provided by the Clinical Practice Research Datalink, continues to grow. However, there are no power calculators specifically designed for these studies in the context of pharmacoepidemiology. Existing instrumental variable analysis power calculators, such as those for Mendelian randomization, cannot be used because pharmacoepidemiological studies will typically have stronger instruments and detect larger causal effects than in other fields. Consequently, there is a need for dedicated power calculators for instrumental variable analysis in pharmacoepidemiology.

Methods and results: We derive the formula for calculating the power of a pharmacoepidemiological study using instrumental variable analysis before validating the formula in a simulation study. The formula is applicable for studies using a single binary instrument to analyse the causal effect of a binary exposure on a continuous outcome. We have also created an online calculator for others to calculate the potential power of their studies (https://venexia.shinyapps.io/PharmIV/). As well as packages in both R and Stata, which are available from GitHub (https://github.com/venexia/PharmIV).

Conclusion: Pharmacoepidemiological studies risk irrelevance if they are insufficiently powered to detect clinically meaningful treatment effects. As the use of instrumental variable analysis becomes more commonplace in this field, there is an increasing need to calculate the power of studies using this type of analysis. In particular, such calculations are often required when requesting access to administrative data. The formula and online tool presented here, allows pharmacoepidemiologists to calculate the power of instrumental variable analysis studies with a single binary instrument, binary exposure and continuous outcome with ease.

# Administrative data as a safe way to research hidden domestic violence journeys

Janet C. Bowstead

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Domestic violence against women is a significant social issue both internationally and within the United Kingdom. However, it is often difficult to research given the hidden nature of the violence, and the need for many women to continue to keep their experiences secret because of ongoing risk from a known abuser – typically a male partner, husband or ex-partner. Walby (2006; 2007, p.5) has argued that "administrative data are in general unsuitable for the measurement of the scope, prevalence and incidence of violence against women because the majority of women who are victims of violence do not report this to any authority", and she cautions that "no extrapolation from administrative data will ever tell us about the extent of the hidden violence against women" (Walby, 2005, p.193). However, administrative data can be used to generate significantly increased knowledge about women who do access services, and provide much larger samples than would be available from survey or qualitative methods. This submission reports on research on women's relocation journeys to escape domestic violence in the UK, using administrative data from a funding programme which required England-wide monitoring from 2003-2010 on housing-related support services. This provided a sample of over 18,000 women per year – a total of over 100,000 journeys to access services – until the data became unavailable due to the end of the funding programme. The presentation will cover some of the substantive findings on women's domestic violence journeys, on patterns and places as well as demographics, which had not previously been able to be researched. It will also discuss the particular opportunity for research enabled by the availability of these administrative data, and the implications and ethics of service funding programmes which do not de-identify monitoring data and make them available for research.

Walby S. 2005. Improving the statistics on violence against women. Statistical Journal of the United Nations Economic Commission for Europe 22: 193–216

Walby S. 2006. Towards International Standards for Data Collection and Statistics on Violence Against Women. ECE/CES/GE.30/2006/7. UN Economic Commission for Europe Statistical Commission, Geneva, Switzerland. Walby S. 2007. Indicators to Measure Violence Against Women. Working Paper 1. UN Economic Commission for Europe Statistical Commission, Geneva, Switzerland.
# Forests, health and inequalities in Scotland: a longitudinal analysis using linked administrative data

Jennifer Thomson, Jamie Pearce, Niamh Shortt, Catharine Ward Thompson

### University of Edinburgh

Studies suggest that living near forests is linked to reduced stress, improved mood and enhanced quality of life. Evidence also suggests that having better access to forests may be particularly beneficial to those of low socioeconomic position. Therefore forests may have a role in reducing health inequalities. This study examined associations between forests and health in Scotland over a 20-year period. In particular the project investigated whether changes in individual's access to forests were associated with changes in health status; and whether people who had lived near forests throughout life had better mental health in later life. The study also explored whether associations varied by social group. Data for all forests in Scotland were created. These were linked to the Scottish Longitudinal Study (SLS) which provided data on 113,171 people living in Scotland for three time points: 1991, 2001 and 2011. Administrative records for the SLS members including the Prescribing Information System and Mental Health Inpatient and Outpatient data sets were also linked. Outcome measures included having a long term limiting illness, receiving hospital treatment for a mental health issue and being prescribed anti-depressant or anxiolytic medication. Preliminary findings showed that people living 250m-1km from a forest were significantly more likely to have a long term limiting illness compared to those living closest (<250m) to a forest. When stratified by area-level income deprivation, this relationship was only significant for those in the 2nd most deprived group. The initial findings from this study show that the health benefits associated with forests in Scotland are likely to be uneven across the population.

Why do escalator regions increase upward social mobility? Linkage of the 1947 Scottish Mental Survey with Scottish Longitudinal Study and Census data

Lynne Forrest<sup>1</sup>, Chris Dibben<sup>1</sup>, Zhiqiang Feng<sup>1</sup>, Ian Deary<sup>2</sup>, Frank Popham<sup>3</sup>

<sup>1</sup>ADRC-Scotland; University of Edinburgh; <sup>2</sup>University of Edinburgh; <sup>3</sup>University of Glasgow

## Introduction

The escalator hypothesis suggests that regions which offer positive labour market opportunities may enhance the social mobility of those who move there. Individuals who relocate to escalator regions may do better than others because of the employment opportunities they are offered, or due to particular characteristics of these geographically-mobile individuals. We were interested in exploring the relationship between geographical and social mobility and the factors that may be important for upward mobility.

## Methods

The 1947 Scottish Mental Survey (a 1936 birth cohort with age 11 cognitive ability test scores), linked with the Scottish Longitudinal Study, and census data, was used to investigate the inter-generational social and geographical mobility of this cohort, and how this relates to their cognitive ability and other factors. We examined how spatial mobility impacts on social mobility, particularly examining whether large metropolitan regions of Scotland, such as Edinburgh, may operate as escalator regions, and why this might be, using linear and logistic regression models.

## Results

Higher childhood cognitive ability and achieved education level were significantly positively associated with upward mobility from childhood to age 55. Those who were geographically mobile, particularly those who moved both in and out of Edinburgh, had significantly higher cognitive ability compared to those who did not move. Movers to Edinburgh were more likely to be upwardly mobile than those who experienced any other geographical trajectory.

## Discussion

Previous research on escalator regions has speculated as to whether it is the place itself or the attributes of those who move there that were important for upward mobility. As those who move to Edinburgh are more likely to be upwardly mobile than those of similar cognitive ability who move elsewhere this would suggest that Edinburgh acts as an escalator region, with improved job opportunities available for those who relocate.

Migration to Scottish New Towns and the impact on premature mortality in Glasgow: analysis of 1947 Scottish Mental Survey data linked to the NHS Central Register

Lynne Forrest<sup>1</sup>, Chris Dibben<sup>1</sup>, Zhiqiang Feng<sup>1</sup>, Ian Deary<sup>2</sup>, Frank Popham<sup>3</sup>

<sup>1</sup>ADRC-Scotland; University of Edinburgh; <sup>2</sup>University of Edinburgh; <sup>3</sup>University of Glasgow

Life expectancy in Glasgow is lower than other Scottish cities and comparable English cities. Whilst a large part of this is explained by the high levels of deprivation, it does not explain it all. A recent report that systematically examined the theories around excess mortality favoured an explanation that includes selective migration, specifically policy in the late 1940s period onwards to move younger, more skilled workers and their families from Glasgow to Scottish New Towns, leaving behind those who are more deprived and unhealthy.

There are five Scottish New Towns, which were established at different time points. They are: Glenrothes (1948), East Kilbride (1949), Cumbernauld (1956), Livingston (1962) and Irvine (1966), currently located in the following health board areas respectively: Fife, Lanarkshire, Lanarkshire, Lothian and Ayrshire.

The 1947 Scottish Mental Survey encompasses a cohort born in 1936 that had cognitive ability assessed at age 11. As this cohort were of young working age at the time of New Towns policy, they represent an opportunity to study the impact of migration to New Towns on premature mortality in Glasgow. Key to doing this is data linkage to NHS Central Register data in order to identify migration, through GP records detailing health board area. NHSCR data contains information on current and previous health board areas dating back to the early 1950s and a move to the appropriate health board area will be used as a proxy for New Town migration. When examining later life health we can put people "back" to their starting geography to see what impact this had on premature mortality in Glasgow and other areas.

The use of administrative datasets to create new cohorts with large sample sizes will allow us to answer research questions that we previously could not, around spatial mobility in Scotland. Linkage to historic datasets allows exploration of factors that may be important across the life course.

# Young caregivers differ from older caregivers: a census-based record linkage study

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<sup>1</sup>Queen's University Belfast; <sup>2</sup>Ulster University

Background: Previous studies and reports have highlighted the effect of caregiving responsibilities on caregivers, however, the predominance of older caregivers and the exponential increased risk of death with age has led to the underrepresentation of young caregivers. The aim of this study was to explore the effect of caregiving on mental health, mobility difficulties and mortality risk of young caregivers in Northern Ireland.

Methods: A census-based record linkage study of data on all residents enumerated in the 2011 Census with subsequently registered mortality information until the end of 2015. The sample consisted of 433,328 individuals aged 5-24 years, with approximately 4.5% (19,621) of the cohort reporting that they were providers of informal care.

Results: Intense caregiving was associated with worse physical health among caregivers aged 5-17 years (OR 1.61 95%CIs 1.16-2.23), but better physical health among aged 18 or older (OR 0.86 95%CIs 0.69-1.08). A positive and dose response relationship was observed between caregiving status and mental ill-health, with the effect being more evident among 5-17 years rather than 18-24 years. There is sufficient evidence to suggest that, in contrast to the relationship at older ages, caregiving in younger people is associated with an increased mortality risk.

Conclusions: This population-based study shows that caregiving status has a different effect on young caregivers when compared to older caregivers.

# Using administrative data in education research and evaluation: challenges and value

Laura Da Costa, Helen Wareham

Centre for Evaluation & Monitoring

The Centre for Evaluation & Monitoring (CEM) at Durham University has been involved in educational assessment and research for over 30 years. We work with schools both nationally and internationally providing assessments and also work with a wide range of research funders including Education Endowment Foundation (EEF), Economic and Social Research Council, the Wolfson Foundation, and Nuffield Foundation.

For the majority of research projects, we utilise administrative data, both publicly available and via special requests, FOIs, etc. An increasing number of these datasets are now available through the Administrative Data Research Network: National Pupil Database (NPD), Higher Education Statistics Agency (HESA), and data on pupils and schools from the UK Department for Education. These datasets are of increasing value and importance for educational research and evaluating the impact of national initiatives and government policy.

There is an increasing demand and pressure to monitor and track student outcomes not just through school and college but into Higher Education and the wider workforce. This presents a number of challenges for researchers but also practitioners working in education and HE, as the access to and linkage of multiple datasets is required to understand and produce outcomes across the full student life cycle. Methodological and practical challenges include ensuring appropriate permissions are in place, collecting the correct information and data to be able to link information, linking data across multiple datasets, and knowing and understanding the limitations and affordances of different datasets.

In this paper, we will discuss some of the issues we have faced, how and if we have solved them, and lessons learnt, with the aim of prompting discussion and sharing practice, particularly in light of the increasing pressure within the education sector for evidence-based work and clear measures of impact.

## **Opportunities for tobacco research using Scotland's maternity records**

Tom Clemens, Chris Dibben, Jamie Pearce, Niamh Shortt

#### University of Edinburgh

Routinely collected Scottish maternity records include maternal smoking information at the time of the first maternity appointment and the nurses visit a few days after delivery as well as residential postcode at the time of delivery. These records are available from the early 1980s and capture the entire population of pregnancies and thus multiple births to the same mother. They therefore constitute a full population longitudinal study of smoking behaviour among pregnant women without issues such as attrition and prohibitively small sample sizes that affect traditional survey based longitudinal studies. As a result, when examining a variety of external influences on individual smoking behaviour, these data can be used to undertake longitudinal analytical approaches such as fixed effects models to control completely for time invariant mother-level confounding and selection effects. For example, there is growing evidence that local tobacco retail environments are associated with individual smoking behaviours which, from a smoking reduction policy perspective, is significant because it may provide evidence for targeting the supply of tobacco products as a means of reducing smoking rates. However, much of this evidence is cross-sectional. This presentation will discuss findings from an analysis in which postcode of residence at delivery is linked to local tobacco retail density information to determine the influence of living in areas of higher tobacco supply for the risk of maternal smoking during pregnancy. It will touch on key aspects of the methodology and findings and thus provide an example of the potential opportunities available for tobacco research using routine maternity data in Scotland.

# Profiling, benchmarking, and exploring Age-Period-Cohort patterns in mortality in the Affluent World: Examples from Scotland and beyond

Jon Minton<sup>1</sup>, Richard Shaw<sup>1</sup>, Mark Green<sup>2</sup>, Laura Vanderbloemen<sup>3</sup>, Frank Popham<sup>1</sup>, Gerry McCartney<sup>4</sup>

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This paper describes two approaches we used in our recent paper on Scottish 'excess deaths', for exploring mortality risks at different ages and in different years, and how these compare between two population groups. These two approaches were: comparative level plots (CLPs), which show deviation in age-specific risks over time between two populations using colour and shade on Lexis surfaces; and a lifetable approach, which quantifies the cumulative impacts of age-specific risk differences over the life course between populations and cohorts in terms of differences in deaths per 100 000 population by different ages.

In the case of Scotland, CLPs were able to identify important cohort effects and agespecific period effects which contribute to overall disadvantage compared with both England & Wales, and from this can help identify possible priority areas for effective intervention to reduce health disparities.

The data used in the analyses was the Human Mortality Database, comprising around 40 countries from across the world, and so the methods provides great scope for rapid population benchmarking and comparison between countries and regions. Examples presented will include Sweden, the USA and Italy. In each case country populations will be compared against their nearest and more distal neighbours.

## Identifying Families in Welsh Administrative Data

Robert French<sup>2</sup>, Karen Tingay<sup>1</sup>, Charles Musselwhite<sup>1</sup>, Matt Roberts<sup>2</sup>, John Gregory<sup>2</sup>, Colin Dayan<sup>2</sup>

<sup>1</sup>Swansea University; <sup>2</sup>Cardiff University

Linked health, education and other administrative records are a tremendous resource for quantitative medical and social science research. Within these datasets of individuals there is the potential to create a 'family identifier' which would allow this critical biological and social construct to be included in research.

This presentation describes the creation of a family identifier from the household identifier being developed within the Farr, CIPHER and ADRC-W teams. We outline the methods behind both the household and family identifiers and verify these against those known through the 2011 Census. We discuss data quality issues associated with collecting and analysing housing data. Finally we demonstrate an application of the family identifier in educational research, showing the importance of considering the family (in addition to other groupings of interest such as schools and neighbourhoods) when modelling attainment.

# 'Sharing for Research Purposes': Chapter 5, Part 5 of the proposed Digital Economy Bill 2016-17 and its Conformity with Legal Restrictions on Administrative Data Sharing in the United Kingdom

### Stergios Aidinlis

Centre for Health, Law and Emerging Technologies (HeLEX) at the University of Oxford

Participants in administrative data sharing in the United Kingdom largely concur with the view that the formal legal framework creates barriers to widening access to data for research purposes. As part of its commitment to alleviate such barriers and promote the production of well-informed social research, the British Government aims to empower public bodies to share more data through its recently proposed Digital Economy Bill 2016-17. Strong criticism has been voiced against the provisions of the Bill for not providing adequate privacy and data protection safeguards and being at odds with the requirements of the forthcoming EU General Data Protection Regulation (GDPR). Scrutinising the validity of such arguments, this paper enquires into the Bill's conformity with legal restrictions on data sharing emerging from data protection and human rights law applicable in the UK. Specifically, the paper sets out to answer two questions. First, it examines whether the conditions for data processing laid in the Bill are compatible with the conditions for lawful processing of personal data under Article 6 of the GDPR. Secondly, it considers whether the Bill satisfies the level of protection afforded to individuals' personal data with regard to the right to private life under Article 8 of the European Convention on Human Rights. Taking note of how other legal 'gateways' to share data were interpreted by the courts, the paper argues that while a lot of improvements could be made to ensure conformity, the Bill's strategic choice to entrust the UK Statistics Authority with oversight powers is in the right direction. Worries about privacy and the lack of nominal adherence to the GDPR can be allayed through developing a proportionate governance framework that facilitates data sharing for research and ensures the least interference with data subjects' rights.

## **Connecting Castles Securely**

Simon Thompson<sup>1</sup>, John Chapman<sup>2</sup>

<sup>1</sup>Swansea University; <sup>2</sup>JISC

The Jisc safe share project (https://www.jisc.ac.uk/rd/projects/safe-share) was a proof of concept project initiated by ADRN and FARR running from 2014-2017 that looked at two aspects of running large multi user systems:--

- To establish a national secure network overlay to enable secure communications between infrastructural elements of the ADRN/FARR estate. The safe share network brings, through a managed service, a security accredited infrastructure capably of fulfilling any regulatory requirements stipulated by national research programmes.
- To establish a national AAAI infrastructure to allow a researchers identity to be shared and credentials used across multiple research platforms while maintaining full accountability, auditing and control. This is achieved by building on a number of previous nationally funded initiatives and working with institutions to integrate systems for the seamless management of this important aspect.

Closer working and systems interoperability between nationally funded research centres is the next big challenge and is critical to increasing the research outputs and return on investment expected by the funders and nation.

We will describe how the virtual overlay and AAAI works, what benefits it could bring and how it might enable future research. The ADRN use case implemented in Wales was a significant factor in Jisc's decision to take this initiative from a proof of concept project into a national service.

# Trajectories of transition from pre-school to primary school: Analysis using the English National Pupil Database

Tammy Campbell, Ludovica Gambaro, Kitty Stewart

London School of Economics

Choice and selection in primary school admissions have long been of interest to researchers, policy-makers, and parents. The recent creep towards decentralisation of and variation in admissions processes under academisation means that investigation of this area is more important than ever.

In this research, we add a new dimension to the evidence on pathways to and factors influencing admissions, by matching longitudinally data from the Early Years Censuses and Spring Schools Censuses, to consider trajectories of transition from pre-school to primary school.

Our analysis addresses questions such as the following: are low-income children more likely than their higher-income peers to change settings between pre-school and primary school? Does this hold even when pupils have attended a school nursery in the year prior to reception? Do low-income children tend to attend primary schools with proportionally fewer pupils from the same pre-school – thus experiencing more change, and less consistency of peers?

We also consider tentatively the associations between different trajectories of transition and children's Foundation Stage Profile scores, assessed by teachers at the end of the first year of primary school. Notwithstanding data limitations, which we discuss, this begins to address the question of whether some transitions are 'better' than others – and we explore which groups of children tend to benefit from these 'better' pathways.

# Assessing disclosure risk in spatially referenced synthetic data using automated zone design

David Martin<sup>1</sup>, Chris Gale<sup>1</sup>, James Robards<sup>2</sup>

## <sup>1</sup>ADRC-England; <sup>2</sup>NCRM

Spatial aggregation is a standard approach to statistical disclosure control (SDC) in population data such as those collected from a census of population. When dealing with the analysis of administrative data, decisions must be made by the data provider regarding appropriate levels of spatial aggregation attached to individual records, both at the point of researcher access within a secure data laboratory and again on release of analysis results. Conventional rules of thumb regarding minimum threshold population sizes may not be a good indicator of risk, particularly where analysis concerns spatial relationships with environmental or social factors which themselves are strongly geographically patterned, presenting additional geoprivacy challenges.

This presentation describes ADRC-E research being jointly undertaken with ESRC's National Centre for Research Methods (NCRM). We have developed a workflow for the enhancement of a synthetic population microdataset from the Consumer Data Research Centre, by adding household structure and georeferencing each household to randomly generated locations which closely match the true population distribution. These non-disclosive microdata can then be used to assess disclosure risks arising from different spatial aggregations. In particular, risks are shown to be much more closely related to the spatial distribution of the variables of analytical interest than to the threshold population sizes used for standard geographical units. The potential for using bespoke spatial aggregations as a means of preparing administrative research datasets for more secure analysis is explored.

## Investigating address accuracy in a key administrative data source

Brian Foley<sup>1</sup>, Ian Shuttleworth<sup>1</sup>, Dermot O'Reilly<sup>1</sup>, David Martin<sup>2</sup>, Chris Gale<sup>2</sup>

<sup>1</sup>Queen's University Belfast; <sup>2</sup>University of Southampton

Due to rising cost, respondent burden and decreasing response rates associated with the traditional population census and social surveys, many national statistical institutes (NSI), including those in the UK, US, Canada and Australia, are increasingly using administrative data to inform official statistics on population and society. For example, the NSI of the UK constituent countries will draw on administrative data to support various elements of the 2021 Census operation and subsequent statistical outputs. It is therefore imperative that the demographic and geographic information held in these sources is reliable, both at individual- and household-level. This research is based on record linkage between the 2011 Northern Ireland (NI) Census and the NI Health Card Registration System (HCRS); taking the former as a reference facilitates an assessment of the accuracy of address information in the HCRS, a key administrative data source providing a high degree of population coverage. The analysis is based on a comparison of the anonymised version of the Unique Property Reference Number (UPRN) assigned to the census and HCRS address of records linked across both data sources. Specific research objectives are to: (a) investigate if households can be accurately recreated in the HCRS given the value and importance of reliable household-level statistics; and (b) quantify the extent of and identify the factors associated with record-level address inaccuracy in the HCRS for the reference time point of April 2011. The research complements ongoing work by the UK's NSI on the feasibility of developing an alternative approach to the traditional population census that is underpinned by administrative data; accurate census statistics have a key role in society with regard to policy making, funding allocations to local areas and planning service delivery.

## Measuring Internal Migration: Comparing Census and Administrative Data

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Internal migration, the movement of people within a country, is a key component of sub-national population re-distribution. However, unlike births and deaths which are measured accurately via registration systems, internal migration is difficult to quantify. Typically, data are collected in many countries through censuses or by the use of administrative sources with a move being defined either as a transition between places over one year, five years, or between censuses, or else as an individual event occurring over a defined time period. Each of these approaches has its strengths and weaknesses. Censuses provide high population coverage but, as in the UK, knowledge of moves is restricted to what happened in the preceding year. Administrative data collect information on the multiple moves that might occur over a time period, which are missed in a census. However, administrative systems rely on being updated regularly and sometimes individuals are slow in doing so. Each approach therefore captures imperfect information on a population in flux.

In this presentation, we therefore investigate internal migration in Northern Ireland (NI) using data from the 2011 NI Census and the health card registration system (HCRS), held in the Northern Ireland Longitudinal Study (NILS), a 28% representative sample of the population. We consider residential moves between Super Output Areas (SOAs) that are observed in the Census and not the HCRS (and vice versa) over various time periods, we assess the geographical comparability of flows between places using both sources, and we estimate models of the propensity to move using census and health record data. Our aim is to inform debates about the measurement of internal migration using administrative sources, a relevant topic given the increasing use of these data by national statistical institutes in the UK and elsewhere to support the production of population statistics.

# National Records of Scotland – Trusted Third Party Indexing Service

David Clark<sup>1</sup>, Gerry Donnelly<sup>1</sup>, Albert King<sup>2</sup>

<sup>1</sup>National Records of Scotland; <sup>2</sup>Scottish Government

This presentation is an opportunity to gain an insight into the National Records of Scotland (NRS) Indexing Service who act as the trusted third party for ADRC-S data linkage projects.

We'll take you through a brief overview of the team and its functions including its primary role of matching the personal identifiers submitted by data controllers to the national research spine and generate study and dataset-specific index numbers. These indexes are used to link pseudo-anonymised records accessed by approved researchers in a safe haven.

We'll also tell you about how we're improving the efficiency and the privacy of record linkage through our work on developing "read-through" index keys, as a method of retaining the work involved in data linkage without creating large databases or repeatedly sharing personal identifying information from datasets required in multiple research projects.

We will then talk you through the example of Education "read-through" of the school pupil censuses in Scotland, and the benefits this provides, for the data controller (reduced burden), the NRS Indexing Service (increased efficiency) and researchers and policy makers (quicker access and increased use of linked administrative data) as well as explaining the reduced privacy risks around the personal identifying information involved in projects using these index keys.

## **Renfrewshire Council Social Care Data Analysis**

David Henderson, Nick Bailey, Colin McCowan, Stewart Mercer

### University of Glasgow

## Background

Administrative health data has been regularly used for decades to inform policy and health practice in the NHS. Anonymised, individual-level data has been increasingly used in recent years to provide even more detailed analyses. Social care data held by Local Authorities has similar potential but has rarely been used for research purposes. As health and social care integration progresses the benefits of analysing individuallevel data is becoming increasingly important.

### Aims

To analyse the quality of social care data collected by the Scottish Government and to assess the levels of provision of care across populations. These findings will inform a larger PhD project where social care data is linked to health data at a National level to assess the interactions between these services.

# Health consequences of young people not in employment, education or training: analysis of mortality risk in Scotland

Zhiqiang Feng<sup>12</sup>, Dawn Everington<sup>3</sup>, Kevin Ralston<sup>2</sup>, Chris Dibben<sup>12</sup>

## <sup>1</sup>ADRC-Scotland; <sup>2</sup>University of Edinburgh; <sup>3</sup>Longitudinal Studies Centre of Scotland

Young people not in employment, education or training (NEET) are a serious policy concern in many European countries. The Europe 2020 flagship initiative Youth on the Move specifies a number of programmes that aim to reduce the number of NEET young people and re-engage them into education and labour market. Although young people not in employment, education or training have been identified as one of the most vulnerable groups since the 1990s, little is known about the long-term effect of NEET experiences, especially the health consequences.

This paper investigates whether being NEET is associated with a higher risk of death. We used the Scottish Longitudinal Study (SLS), which collates information from the 1991, 2001, and 2011 censuses as well as from vital events, for a 5.3% representative sample of the Scottish population. Linked health data such as hospital admissions are also available.

We followed around 10,000 young people who were aged 16-19 in 1991 up to 2010. We explored whether NEET young people in 1991 displayed a higher risk of mortality in the 20 years of the follow-up period. Both descriptive and modelling approaches were used in our analysis. Cox models were fitted to predict the risk of death for NEET young people compared to that of non-NEETs. Confounders included individual socioeconomic characteristics, health conditions and local area characteristics. Modelling results showed that being NEET in 1991 was associated with an elevated risk of mortality. The elevated risk remained even when the models were fitted separately by gender. Policy intervention is necessary in assisting NEET young people to re-engage in education or employment.

## **Retention and Destinations of Learners in Sixth Form Schools**

Rhys Davies<sup>1</sup>, Katy Huxley<sup>1</sup>, Chris Taylor<sup>2</sup>

## <sup>1</sup>ADRC-Wales; <sup>2</sup>WISERD

Whilst there is a well-established literature that has examined non-completion within Higher Education settings, evidence on non-completion within the FE sector is relatively limited. This paper provides evidence as to the extent and nature of noncompletion among Sixth Form learners in Wales and the movement of these learners from Sixth Form to the Further Education (FE) sector. The analysis is based upon data from the National Pupil Database (NPD) linked to the Lifelong Learning Record for Wales (LLWR). The analysis was based upon two cohorts of learners who were in Year 11, their final year of compulsory education, during 2011/12 and 2012/13. Analysis reveals that almost 1 in 4 A/AS-level learners in Year 12 during 2013/14 are not studying A-levels in Sixth Form during the following academic year and that low levels of educational attainment at GCSE were the most important factor in contributing to an increased likelihood of non-progression among A-level students between Year 12 and Year 13. However, even after accounting for levels of attainment at GCSE, those with higher levels of absenteeism at Year 11 were also found to be more likely not to progress in their A-level studies between Year 12 and Year 13. Among nonprogressing A-level learners, approximately half were identified as having attended an FE institution in the same or following year. Those withdrawing from Sixth Form during Year 12 entered FE more quickly than non-progressing A/AS level learners. Further research should be undertaken with learners to investigate the circumstances and influences surrounding their withdrawal, non-completion or non-progression in Sixth Form and their participation in Further Education courses or other routes.

# A case cross over study of neighbourhood alcohol retail outlet density and maternal drinking behaviours during pregnancy

Jamie Pearce, Tom Clemens, Niamh Shortt, Chris Dibben

### University of Edinburgh

Recent international evidence suggests that the provision of neighbourhood alcohol retailing is associated with individual-level alcohol-related outcomes and consumption patterns, including 'problem' and 'binge' drinking. In the UK these findings are being used to advocate for new alcohol policy initiatives that target the local supply of alcohol as a means of reducing local alcohol consumption. However, most of the evidence connecting alcohol retail density and alcohol consumption is based on crosssectional research designs and establishing a causal relationship is problematic. The focus of this study is Scotland where a reduction in alcohol-related harm has been identified as a national priority. We use a case cross over study design and routinely collected full population Scottish maternity data to consider the effects of neighbourhood exposure to alcohol retailing on women's alcohol consumption during pregnancy. The Scottish maternity records include information on alcohol consumption and postcode of residence at delivery which we use to geographically link to GIS measures of alcohol retail density. Using the full population of births (2000-2015) enables the capture of all multiple births to the same mother and therefore to examine the extent to which changes in alcohol consumption between pregnancies are associated with changes in alcohol retail density exposure (through residential moves between pregnancies). To examine the effects of exposure to alcohol outlet density, we use fixed effects regression which treats each mother as their own control and removes all confounding by time-invariant characteristics of the mother. The findings strengthen the international evidence base linking the local provision of alcohol retailing and drinking behaviour. The public health implications of the work are considered.

## Creating a postcode history from medical sources for longitudinal analyses

Dawn Everington, Zengyi Huang, Zhiqiang Feng

Scottish Longitudinal Study Development & Support Unit

The Scottish Longitudinal Study (SLS) is a large-scale linkage study created using data from administrative and statistical sources. These include: census data from 1991 onwards; vital events data (births, deaths, marriages); NHS Central Register data (migration into or out of Scotland); and education data (Schools Census and SQA data).

There are many advantages to using these data: they are a large, representative sample of the Scottish population with a low attrition rate. The SLS includes a range of variables describing demographic, economic, health, education, cultural, housing, social and ecological data. Our sample is further linked to ISD health data including cancer registrations, hospital admissions etc. One of the main disadvantages of this study is that although the vital event, education and health data can be regularly updated, the Census variables are only known at the 10 year time points. Trying to determine cause and effect without full histories is clearly more difficult.

To address this, NHS Scotland have provided postcode data obtained from GP registrations and other health records since 2000. Although the data will not be provided to users in their fine geographical details, as far as we know, this is the first time that these data are available for longitudinal analyses on a small area scale. These data will be of particular interest to researchers wishing to study migration. They will also allow area effects such as deprivation and urban\rural classification to be looked at over time.

This presentation will describe the characteristics, difficulties and processing of these data. The data are validated by comparison to the enumeration postcodes in 2001 and 2011 which are highly accurate. Future analyses will investigate how the match rate varies by other characteristics such as age, gender, economic activity and geographical area.

# Maternal mortality and substance use during pregnancy: analysis of administrative data for England (2002-2014).

Ruth Blackburn<sup>12</sup>, Katie Harron<sup>3</sup>, Linda Wijlaars<sup>4</sup>, Astrid Guttman<sup>5</sup>, Ruth Gilbert<sup>12</sup>

<sup>1</sup>ADRC-England <sup>2</sup>University College London; <sup>3</sup>London School of Hygiene and Tropical Medicine; <sup>4</sup>University College London; <sup>5</sup>Institute for Clinical Evaluative Sciences, Ontario - Canada

## Aims

We aimed to investigate neonatal abstinence syndrome (NAS) as a marker of druguse in pregnancy and to compare long-term maternal all-cause mortality relative to women without a NAS-pregnancy.

## Methods

De-identified Hospital Episodes Statistics (HES) inpatient data including hospital, GP practice, maternal age and birthweight were used for deterministic and probabilistic linkage of mothers to babies born in England between 1st April 2002 and 31st March 2014. Women who used drugs during pregnancy were identified from the baby's record indicating NAS within a month of birth. All remaining mothers formed the comparison cohort. Deaths were identified from linked Office of National Statistics Mortality data. A single index birth was selected at random for each women, with the delivery date marking the start of follow-up. The association between drug use in pregnancy and the rate of mortality was modelled using Poisson regression with the log of follow-up time included as an offset.

## Results

The study population comprised 14,436 women with a NAS baby and 4,547,929 women without a NAS baby, corresponding to over 96% of all live births. On average, women with a NAS baby were slightly younger at the time of delivery (median age 28 years versus 30 years, p<0.001) and a greater proportion had their first child in their teenage years (7.3% vs 4.9%, p<0.001). Ten-year mortality per 1000 person years was 4.02 (3.63-4.46) amongst women with a NAS baby and 0.37 (0.36-0.37) for women without a NAS baby, yielding a crude incident rate ratio of 10.9 (95% CI 9.85-12.2).

## Conclusions

Women giving birth to infants with NAS are a population at high risk of premature mortality. Public health programs need to target both the infants and mothers. Linkage within and between administrative datasets could help evaluate targeted interventions and are useful for identifying vulnerable and hidden population groups.

# Association between area based social deprivation index and survival in out of hospital cardiac arrest patients across Scotland.

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<sup>1</sup>Resuscitation Research Group at the University of Edinburgh; <sup>2</sup>Scottish Government; <sup>3</sup> University of Aberdeen; <sup>4</sup>Emergency Medicine NHS Lothian

### Background

Survival among out of hospital cardiac arrest (OHCA) patients in Scotland is poor compared with other countries. There is evidence that people from a deprived socioeconomic background are more likely to suffer from an OHCA and have lower subsequent survival rates compared with patients living in other areas. The aim of the current project is to investigate the association between incidence and survival of OHCA cases in Scotland and the Scottish Index for Multiple Deprivation (SIMD, an area based socioeconomic status indicator) using a large, recently established cohort of OHCA cases.

## Methods

Based on data from the Scottish Ambulance Service all OHCA cases between 2011-2015 where resuscitation was attempted were identified. The eDRIS team linked the OHCA cases based on Community Health Index (CHI) number or probabilistic linkage to a range of administrative datasets including demographics, mortality, hospital data (SMR01), morbidity (SPARRA) and SIMD (part of the Unscheduled Care Datamart). Logistic regression analyses were used to analyse the data.

## Brief results

Of all OHCA (n= 9257) cases which could be linked with other data, 28% were living in the most deprived areas of Scotland (SIMD quintile 1) compared to 14% of OHCA cases affecting those living in the least deprived areas (SIMD quintile 5). Logistic regression modelling, including adjustment for possible confounders such as age and gender, showed that people from the most deprived areas are 43% less likely to be discharged alive from hospital compared to people from least deprived areas. Ageand sex-stratified analyses showed that this effect is most pronounced among males and young females.

## Public benefit

The insight into inequalities with respect to social deprivation and OHCA incidence and survival will inform the design and implementation of policy, for example care delivery and awareness campaigns.

# Household change and proximity to death – an analysis using linked administrative records

Anna Schneider

Edinburgh Napier University

Background - Various policy initiatives in Scotland have been endeavoring to enable people to remain residentially independent in their last days of life. Many people, when confronted with their own death, wish for that final event to be in their own home. Informal care is an important component of enabling such wishes to be met.

The final days of life are a dynamic period of residential change, with moves into and out of hospital, into hospice care, or possibly even to reside with adult children. The household circumstances of people at this point in time are currently poorly understood. This paper investigates the changing residential circumstances of people in Scotland as they approach their death.

Method - Data from the 2001 and 2011 censuses and death records are used to create synthetic cohorts for everyone in Scotland who died within a year of census enumeration. Other data, including cancer registry and hospital admissions, are linked. Analysis explores the associations between household structure, time from census to death, cause of death (as proxy for ability to plan care), and whether or not death occurred at home or in an institution.

Impact - The study is one of several funded by the ESRC as part of the development of the Administrative Data Research Centre – Scotland. Results of the analysis will be discussed in light of their implications for health and social care integration and with regard to the contribution that analysis of administrative data can make to informed policy.

Combining commercial firm data with administrative employer-employee data – methodological challenges of linkage, preparation and representativity

Manfred Antoni, Marie-Christine Laible

Institute for Employment Research

We describe the linkage of commercial firm data from Bureau van Dijk (BvD) with administrative employment data of the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB). BvD is a commercial provider of firm data. Its databases have mainly been used for analyzing business intelligence and are well renowned with companies researching competitors, suppliers or business partners. Meanwhile, the FDZ has been providing cost-free access to administrative and survey data to researchers for over a decade.

To combine the research potential of both data sources, the FDZ has performed a record linkage of companies (independent unit) given in BvD's database orbis with the establishments (dependent subunits) given in the Establishment History Panel (BHP) of the FDZ. Thus far, no large-scale linkage between BvD data and administrative data had been successful. The major obstacle is that the two data sources do not contain a common identifier that would allow a direct linkage. The FDZ thus performed the linkage by comparing, amongst others, the names of companies and establishments given in the original databases. We first present the challenges of the linkage process (e.g. preprocessing, comparison, classification) and the methods the FDZ has applied to overcome them. Secondly, we present representativity analyses to demonstrate the usefulness of the resulting linked dataset, which contains longitudinal information on companies, their dependent establishments and all of their employees.

# Using Linked Administrative Data to Examine the Impact of the Seizure and Investigation of Illegal Drug Consignments on Local Communities

Ben Matthews<sup>1</sup>, Chris Dibben<sup>1</sup>, Susan McVie<sup>1</sup>, Stuart Weatherley<sup>2</sup>

<sup>1</sup>University of Edinburgh; <sup>2</sup>National Crime Agency

With the spread of online cryptomarkets the supply of illegal drugs being received through the post is a growing problem in the UK. When a package containing illegal drugs being delivered into the UK is identified by the UK Border Force there are a number of different responses available to law enforcement agencies; specifically the seizure of the package only or further investigation by the National Crime Agency or police. However, little is known about the effects of different interventions when packages are seized. This uncertainty is compounded by difficulty in establishing the effects of different interventions, given the potentially broad impacts of changes in the drugs supply both on local crime rates but also on the health of the local population.

This project investigates methods to explore the impact of different criminal justice responses to illegal drugs consignments by applying quasi-experimental statistical methods to linked administrative data. This analysis draws on a dataset of illegal consignments destined for Scotland passed from the UK Border Agency to the National Crime Agency between 2011 and 2016. Illegal consignment data are linked to recorded crime and health data in order to examine the effects of the intervention taken on health and crime outcomes the local area to which the package was destined. In doing so, this study provides an example of the benefit of linked administrative data by allowing analysis of an otherwise hard-to-investigate research area (the supply of illegal drugs), and also by allowing the exploration of the wider impacts of covert law enforcement tactics outside of purely criminal justice outcomes.

# Inequalities in school leavers' labour market outcomes: do school subject choices matter?

Cristina Iannelli, Adriana Duta

Moray House School of Education, University of Edinburgh; AQMeN

Despite a large international literature on the effect of vocational and general education on school-to-work transition, relatively little is known about the role of having studied specific subjects in explaining inequalities in young people's labour market outcomes. This paper aims to fill this gap by examining the extent to which subject choices mediate social background and gender differences in early labour market integration of young people who left education early, either at the end of compulsory schooling or at the end of secondary school. We use data from the Scottish Longitudinal Study which is a large-scale linkage study created using data from administrative and statistical sources. These include: census data from 1991 onwards; vital events data (births, deaths, marriages); NHS Central Register data (gives information on migration into or out of Scotland); and education data (including Schools Census and SQA data). Our extract contains information about individuals' ascriptive characteristics (gender and family background) from 2001 Census data, their activity status from 2011 Census data, and their educational attainment (with detailed information about subjects studied and grades achieved). We analyse gender and social class differences in school leavers' employment status and type of occupation entered and the extent to which these differences can be explained by school subject choices (and attainment). The results show little gender differences but strong parental background differences in young people's labour market outcomes. Only a few subjects were associated with a reduction in the chances of being unemployed/inactive. Overall grades were found to be more important in explaining social background differences among lower-secondary leavers while curriculum more important in explaining the same differences among upper-secondary leavers.

Childhood cognitive function and later-life economic activity: Linking the Scottish Mental Survey 1947 to administrative data.

Matthew H. Iveson<sup>12</sup>, Ian J. Deary<sup>2</sup>, Chris Dibben<sup>1</sup>

<sup>1</sup>ADRC-Scotland; <sup>2</sup>CCACE

As the population ages, and individuals are expected to work and function for longer, it is increasingly important to understand what contributes to economic activity in later life. Recent work has shown that mid-life unemployment risk can be predicted by early-life circumstances, particularly childhood socioeconomic status and childhood cognitive ability. However, very little work has been done to investigate the contribution of early-life factors to unemployment risk in the latter-part of the working life, in which the rates of long-term unemployment are particularly high. The proposed study investigates the association between early-life factors (childhood cognitive ability and socioeconomic status) and the risk of unemployment in later-life by linking historical data from the Scottish Mental Survey 1947 to Scottish Census data from 1991, 2001, and 2011. Around 1800 linked records will be taken from the Scottish Longitudinal Study. In addition to investigating cognitive and social factors, the risk of unemployment will also be investigated in terms of the type of occupation or industry to account for the physical demands of the workplace and the changing trends in industrial employment. Understanding the factors which contribute to economic activity around retirement age may aid the development of interventions designed to promote productivity and wellbeing in older-age.

# Geographies of Deprivation: Insights from Mapping Administrative Data in a Rural Area

David Clelland, Carol Hill

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The use of high profile and increasingly sophisticated 'indices of multiple deprivation' to measure geographical variations in deprivation between neighbourhoods is well established in a number of countries. These are attractive to national and local policymakers as a superficially simple indicator and aid to resource allocation decisions. These approaches have however been subject to critique on both conceptual and practical grounds, with their suitability for rural areas particularly contested.

This paper illustrates and quantifies some of the potential shortcomings of deprivation indices based on a quantitative secondary data analysis, mapping the results of Scottish Index of Multiple Deprivation (SIMD) against other small-area indicators, including Census data and local authority administrative data for the largely rural region of Dumfries and Galloway.

The SIMD represents, in many respects, a robust and sophisticated technique to measure relative levels of deprivation. However, this analysis highlights the extent to which the practice of assigning single scores to identify the apparently 'most deprived' areas risks disguising the more complex geographical distribution of deprivation. Significantly, the extent to which this area-based approach is effective in capturing deprived people or households is itself geographically variable. This work also seeks to explore the potential value of administrative data in understanding spatial patterns of deprivation and policy measures, illustrated though mapping local data on applications to the Scottish Welfare Fund.

This paper contributes to the understanding of the suitability and limitations of small area indices of multiple deprivation for determining resource allocation in different contexts. The findings also demonstrate the potential for spatial administrative data to inform local policy decisions. A number of questions for further research are also suggested. Given the numerous examples of similar measures employed by local and national governments, these findings have wider relevance.

# Monitoring (risks of) survey non-response biases during data collection: Can collection be ended early without impacting on dataset quality?

Jamie Moore, Peter Smith, Gabriele B. Durrant

ADRC-England; Department of Social Statistics & Demography, University of Southampton

If some sample members do not respond to a survey and they differ from respondents, the resulting survey estimates may deviate from population values. Survey designers expend considerable effort to minimise these non-response biases, including repeatedly attempting to interview non-responding sample members. Even with such strategies though, non-response still occurs, so relationships between interview attempts made and data quality benefits will be non-linear. Hence, the question arises as to how many interview attempts to make. Addressing this requires monitoring of non-response biases over data collection. However, such biases are difficult to quantify because non-respondent answers do not exist.

One solution to this problem is to use linked sample member information from other sources to monitor non-response bias risks in terms of sample-respondent dataset similarity, but the accuracy of such monitoring has yet to be evaluated. Here, we consider this question in the UK Labour Force Survey (LFS), using a dataset linking (individual level) survey responses to sample member census attribute information and call record data detailing interview attempts. We utilise representativeness indicators, decomposable sample-subset similarity measures based on variation in estimated inclusion propensities given an attribute covariate set, to quantify bias risks, and given these identify points in the call record after which dataset quality does not substantially improve. Next, we evaluate inference from indicators, studying both survey covariates with analogues among the census attribute covariates and those without analogues. Given findings, we then consider data collection in the LFS, and offer guidance on the use of these techniques to monitor non-response bias risks in other surveys.

Monitoring survey measurement error over the course of data collection: do 'late' respondents give more inaccurate answers?

Jamie Moore, Gabriele B. Durrant, Peter Smith

ADRC-England; Department of Social Statistics & Demography, University of Southampton

Survey measurement error is a concern to methodologists: do respondents answer items accurately? A body of research exists on the topic, usually involving comparing respondent answers to equivalent information from other (more accurate) data sources such as a population registry, administrative records or a census. An aspect receiving little attention though, and of importance in modern survey designs, is whether error incidence differs over the course of data collection. To increase dataset quality, surveys often repeatedly follow-up sample members that have not yet responded to the survey request. However, reluctant, 'late' respondents may be more likely to respond inaccurately to items. If so, the extra efforts may be a sub-optimal use of resources, as the interviews obtained could actually reduce the data quality of the resulting survey estimates.

We address this question in the UK Labour Force Survey (LFS), utilising a dataset in which we link survey respondent item answers to equivalent information from a contemporaneous census and survey call record data detailing numbers of interview attempts (a development of the 2011 Office for National Statistics Census Non-Response Link Study). We use logistic regression to estimate the probability of respondent answers differing between data sources at each call in the call record. As well, we use multinomial regression to similarly estimate the probability of specific differences, for example whether fewer or more household members are reported. We then discuss our findings in the context of data collection strategies in the LFS and other surveys.

# Mortality and ethnicity: minorities fare better than the White Scottish majority in the Scottish Health and Ethnicity Linkage Study (SHELS)

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Background: Ethnic minority groups are often perceived to have worse health than the majority population but some research focusing on the minority mortality advantage in the US and in Europe suggests a more complex picture.

Methods: In Scotland, the 2001 census, giving self-reported ethnicity, was linked to 12 years of deaths (2001-2013), providing a retrospective cohort of 4.62 million people. We used Poisson regression to calculate mortality rate ratios (RRs) and their 95% confidence interval (CI) for 13 ethnic groups by sex and adjusted for age, socio-economic status (SES) (area deprivation, household tenure, educational status) and country of birth (CoB). White Scottish were the reference population (RR=100). Life expectancy at birth (LE) estimates were produced from the linked Census 2001 population and 3 years of deaths from 2001 using the revised Chiang method.

Results: In men, all minority groups had lower mortality RRs apart from the Any Mixed Background group (111.3). In women, all ethnic minority groups had lower RRs than the reference. Adjusting for CoB and SES attenuated but did not remove the differences in RRs (95% CI excluded 100) e.g. Other White British (89.4), Indian (82.6), Pakistani (75.5), Chinese (59.3) in men and Other White British (91.1), White Irish (89.2), Indian (78.1), Pakistani (87.3), and Chinese (80.3) in women. LE was 74.7 years in White Scottish men similar to Mixed Background (73.0) and Irish (75.0) men but shorter than in other ethnic groups, Indian men having the longest LE (80.9). LE in White Scottish women was 79.4 years, similar to Mixed Background women (79.3) but shorter than in any other ethnic groups.

Conclusions: Even when accounting for CoB and SES, most ethnic minority groups had lower all-cause mortality than the majority White Scottish population, findings reflected by longer life expectancies compared to the majority population.

# The educational impacts of income supplements to deprived children and families

Ben Matthews<sup>1</sup>, Kenneth Gibb<sup>2</sup>, Chris Dibben<sup>1</sup>

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There is a longstanding interest in the effects of cash grants to low-income families on children's educational attendance, based in part on a belief that a family's lack of resources can be a barrier to school participation. Whilst such interventions have been shown to be effective in low-income countries, there is only limited evidence of their effectiveness in high-income countries. One problem in identifying the effects of such interventions is that Randomised Control Trials (RCTs), a research design typically used for this purpose, are often very expensive and in some circumstances can be considered unethical.

This paper explores an alternative method to examine the impacts of income supplements by using quasi-experimental methods on a linked administrative dataset to examine the effects of cash grants on school attendance for children living in the Greater Glasgow area. Cash for Kids is a UK charity who provide cash grants as income supplements to disadvantaged families, and whilst the grants provide important help to those in severe need it is less clear whether these short-term income supplements make a longer term difference to those supported. To analyse the effects of Cash for Kids grants on school attendance we link data on grant recipients to Census data and Scottish Government data on school attendance and exclusions. This data linkage allows control groups to be created and school attendance compared between families who receive cash grants and similar families who do not receive them. The analysis both helps to understand the impacts of cash transfer programs on educational participation in high-income countries, as well as exploring the capacity for linkage between existing administrative datasets to identify such effects without the use of RCTs.

# A sibling study of whether maternal exposure to different types of natural space is related to birth weight

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## Background

Birth weight is an important determinant of health across the life course. Maternal exposure to natural space has been linked to higher birth weight, but stronger evidence of a causal link is needed. We use a quasi-experimental sibling study design to investigate if change in the mother's exposure to natural space between births was related to birth weight in urban Scotland.

### Methods

Amount (% area) of total natural space, total accessible (public) natural space, parks, woodlands and open water within 100 m of the mother's postcode was calculated for eligible births (n=40,194; 1991-2010) in the Scottish Longitudinal Study (a semi-random 5.3% sample of the Scottish population). Associations between natural space and birth weight were estimated, using ordinary least squares and fixed effects models.

## Results

Birth weight was associated with the total amount of natural space around the mother's home (+8.2 g for interquartile range increase), but was unrelated to specific types of natural space. This whole-sample relationship disappeared in the sibling analysis, indicating residual confounding. The sibling models showed effects for total natural space with births to women who already had children (+20.1 g), and to those with an intermediate level of education (+14.1 g).

## Conclusion

The importance of total natural space for birth weight suggests benefits can be experienced near to as well as within natural space. Ensuring expectant mothers have good access to high quality neighbourhood natural space has the potential to improve the infant's start in life, and consequently their health trajectory over the life course.

# Me-D-Links: metformin for diabetes in pregnancy – an analysis of health and education outcomes using linked administrative data

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Traditionally insulin has been considered the 'gold standard' for the treatment of diabetes in pregnancy but since 2015 the UK guidelines have also recommended metformin, an oral blood glucose lowering drug. The routine use of metformin in pregnancy is however controversial. Metformin has been shown to cross the placenta and we do not know if it affects the growth or long term development of children who were exposed in the womb. With increasing numbers of women in the UK taking metformin during their pregnancy more research is needed to determine its potential harms or benefits.

This study aims to use routinely collected administrative data to explore the effect of metformin on maternal and infant health and early childhood educational achievement.

As metformin is not commonly used in pregnancy, and some of the pregnancy complications in which we are interested are rare, it is necessary to use data from as large an area as possible. Through the Administrative Data Research Network (ADRN) we aim to access prescribing records, mother and child health records and educational records from all 4 regions of the UK. The outcomes among pregnant women, or infants, who were exposed to metformin will then be compared to those who were not.

The findings of this research will help women and their health care providers make more informed decisions about their care. As one of the first, if not the first, projects conducted within the ADRN using data from all 4 regions of the UK this project will also help to clarify the processes involved and assist in the design and conduct of future UK wide projects.

# A framework for classifying studies of linked data to facilitate sensitivity and bias analysis for linkage error

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Linkage error—missed links between records that pertain to the same individual or false links between records that do not—can reduce the quality of linked data and influence the validity and precision of analysis results. The influence of linkage error is complex, depending on the research question, the study design and the characteristics of the population or sample. Furthermore, in many applications, all possible linkage algorithms and probabilistic thresholds can involve biases in the same direction. In such cases, the common approach of varying linkage methods is inadequate for measuring sensitivity or bias. This presentation will describe a framework for classifying studies of linked data to facilitate sensitivity and bias analyses that account for the influence of linkage error. The classification system helps to identify combinations of design elements that differ across data linkage studies and affect the way that linkage error influences parameter estimates. In the context of each classification, missed links and false links can be translated into effects of selection bias and information bias, which in turn facilitates implementation of standard epidemiologic techniques for sensitivity and bias analysis.

For any combination of one or two variables and one or two datasets, ten classifications of study design can be identified. For each classification, a simple spreadsheet-based calculator can be used to implement quantitative bias analysis for a range of common statistics (prevalence, odds ratio, relative risk, etc.). More sophisticated tools are required for complex designs and analysis models but this classification framework can still help to identify relevant bias parameters and likely directions of bias.

## The black cat in the status quo: the impact of not using administrative data

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## Introduction

It is generally acknowledged that the advantages of using administrative data in research for public benefit are manifold. There is a wealth of studies in the literature that have made use of various kinds of data collected in the course public service provision and delivery to lead to improvements in people's lives. However, less has been published on the harms that occur if administrative data are not used, and even scarcer is collated information on the impact of a broad spectrum of data `non-use'.

## Methods

Primarily focussing on health and social care, we describe an international case study that explores data non-use: sources and types of data non-use, some of the reasons it occurs, its implications for citizens and society, and why it can be difficult to attribute unequivocally. We include a range of issues across care records, research datasets and governance frameworks with associated cases to illustrate data non-use.

## Results and discussion

Using the international case studies as examples, we show there are multiple explanations for this complex issue, and the devastating impacts it can have. The degree of certainty with which it would be possible to prove in law that an impact was due to data non-use varies with cause. However, there is ample indirect evidence that data non-use is implicated in the deaths of many thousands of people and potentially £billions in financial burdens to societies.

## Conclusions

Harm due to the non-use of data is a real problem with widespread and serious, if largely unquantifiable, consequences. Safety is paramount, but not sharing and reusing data is demonstrably not a safe option. Only with a clearer picture of benefits and harms will we be able to move steadily towards socially responsible reuse of data becoming the norm to save lives and resources.
Emotional and behavioral difficulties in early childhood and risk of injury in early adolescence: A longitudinal data linkage study using linked cohort and routinely collected health records.

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## Objective:

The study investigated whether early behavioral and emotional difficulties, measured by the Strengths and Difficulties Questionnaire (SDQ), predict the risk of injury in early adolescence using data linkage between Welsh Millennium Cohort Study participants and routine health records.

## Method:

Data for 1651 (850 boys and 801 girls) children at age 3 and 1699 (874 boys and 825 girls) at age 5 with parent reported SDQ scores and consent to link to health records were linked through the Secure Anonymised Information Linkage (SAIL) Databank. The primary outcome was the first injury related admission, recorded in hospital or emergency department, during early adolescence (11-14 years), analysed by fitting non-adjusted and adjusted (family factors, socio-economic level, gender) Cox Proportional Hazard regression models. Emotional and behavioral difficulties were estimated by SDQ component scores (conduct disorder (CD), hyperactivity (HA), emotional difficulties, peer relationship problems, pro-social behaviors and `Total Difficulty' scores).

## Results:

High HA and CD scores were more common at age 3 than age 5 and more prevalent in boys than girls at both ages. Children with higher HA and CD scores were at increased risk of injury in early adolescence. The adjusted HR (95%CI) for HA at ages 3 and 5 respectively were 1.50 (1.12-2.02) and 1.65 (1.15-2.25), and for CD 1.25 (0.98-1.60) and 1.47 (1.04-2.09). Boys with high HA scores at ages 3 and 5 were more likely to experience an adolescent injury: respective HR (95%CI) 1.60 (1.12-2.3) and 1.44 (0.96-2.16); as were girls at age 5: 2.32 (1.26-4.24).

## Conclusion:

The findings indicate that parent reported behavioral difficulties in the preschool years are associated with an increased risk of injury in early adolescence. Future analysis will explore the type of injury associated with the preschool behavioral and emotional difficulties, and incorporate Scottish health data.

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# Using linkage of administrative data to build a national database for analysis of birth and its outcome in England and Wales

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## Background

In England and Wales, the data recorded at civil birth registration are mainly sociodemographic, while systems used to record hospital care in general and care at delivery in particular, contain very few demographic data items. The birth notification dataset, recorded when a newborn baby's NHS number, a unique identifier, is allocated contains key items not present in the birth registration or hospital systems. A series of collaborative projects was undertaken to build a linked database.

## Method

The first project piloted linkage registration and notification data for births in 2005. The second project, linked in maternity records from the Hospital Episode Statistics (HES) for England and the National Community Child Health Database / Patient Episode Database Wales for 2005-7 and the third extended this to include births from 2005 to 2014 and linked in data about subsequent admissions of mothers and babies to hospital. A further project plans to link these data to educational records of children born in 2005-06 to investigate the educational attainment of children born preterm.

## Results

The data linkages greatly enhanced the scope and range of data available about births and their outcome. For example Linking birth registration and notification made it possible to analyse births by baby's ethnicity, mother's country of birth and gestational age and showed that rates of preterm birth among babies of black African ethnicity are much higher for babies whose mothers were born in West or Middle Africa than among those whose mothers were born in East Africa. Using linkage with hospital data has shown that rates of caesarean section vary by mothers' countries of birth with higher rates among women born in countries high rates of caesarean section. Linkage has enabled national analyses of births by time of day, day of the week and mode of onset and delivery. These show that spontaneous births are more likely to occur at night but obstetric intervention has disrupted this pattern.

## Discussion and conclusions

Linkage of administrative data has increased the scope and range of national maternity data for England and Wales, but there have been many challenges to overcome, particularly obstacles to data access.

# Evaluating Emergency Department overcrowding at regional level: a study in Lombardy region (Italy)

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Overcrowding in Emergency Departments (EDs) is a major problem for healthcare systems, which leads to increased morbidity and mortality.

In 2016, a new automatic flow of data was established in Lombardy Region (Italy; about 9.5m residents) from all the regional EDs to the Regional Agency for Urgency/Emergency (AREU), which is in charge of the Emergency Medical Services system.

Every 3 minutes, EDs provide data for calculating NEDOCS, which is an internationally accepted index for measuring ED crowding. The aim is to evaluate NEDOCS in real time and on the entire regional territory, in order to address ambulances and citizens to less crowded EDs.

We analysed data, from May 9th to May 22nd 2016, in order to assess their quality and the association of overcrowding with hospital features. At the time, only 71 EDs out of 119 actually provided data to AREU.

The quality of data was variable dependent. In particular, the number of patient on boarding and the boarding time showed a low quality, mainly because several IT systems did not trace dischargeable patients. At last, only 13 hospitals out of 71 presented a good quality for all the data needed for NEDOCS evaluation.

A 2-level hierarchical logistic model was developed to analyse the association of overcrowding (NEDOCS > 100) with time-related variables (week day, day time, number of new patients, average waiting time, patient in charge, number of urgent patients), and ED variables (level of specialty, patients daily average number, ED beds, fast track, white-codes ambulatory, NMR equipment, rural/urban ED , regional area). All the time-level variables were associated with overcrowding; while at hospital level only two variables (rural /urban and NMR equipment) were near significance.

The study provided useful insights for improving the data quality and the effectiveness of countermeasures to ED overcrowding.

# Lifetime experiences of care among children in England: analysis of administrative social care data

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## Background

Routinely-published statistics for children placed in out-of-home care (OHC) in England are generally limited to experiences of care in a 12-month period. Longitudinal analyses that describe experiences of OHC throughout childhood are possible using administrative social care data, but are currently lacking.

## Methods

We analysed Children Looked After return (CLA) data for a one-third sample of children born 1st January 1992 to 31st December 1994. This longitudinal data extract obtained from the Department for Education contained care histories from birth to age 18 for 19,849 children in England. We described variation in childhood experiences of OHC, including total time in care, the number of placement moves and destination at final exit from the care system. We then used latent class analysis to identify common childhood experiences of care.

#### Results

On average, children spent 32 months in OHC throughout childhood and experienced two placement moves. Most children had a single period of OHC; however, one-third (33.0%) entered care multiple times. When leaving the care system for the final time, children most often returned home to their parents (42.6%), moved to independent living (17.6%) or "aged out" of the system (16.2%). Latent class analysis identified a number of common, age-specific experiences of OHC based on characteristics such as legal status, placement setting and stability. For example, among children who first entered OHC aged sixteen or older (n=2,178), four common experiences were identified: "short, single, voluntary placement" (49.4%), "long, single, voluntary placement" (36.9%), "court-ordered care" (7.7%) and "cyclical, voluntary placements" (6.0%).

## Conclusions

Longitudinal analyses are useful for exploring variation in children's experiences of care which cannot be captured by standard 12-month statistical 'snapshots'. Further work to explore how latent classes of OHC experiences may be related to variation in outcomes for children in care is required.

# Selective Religious Migration across the Life course: Evidence from Northern Ireland 1981-2011

Brad Campbell, Ian Shuttleworth & Catherine McName

#### Queen's University Belfast

Since the signing of the Good Friday Agreement in 1998, Northern Ireland has prospered from the economic dividend of peace and political stability. However, one important facet of Northern Ireland's divided past - inter communal residential segregation between Protestants and Catholics remains persistently high. Using the Age, Period and Cohort (APC) model as a methodological and theoretical framework this paper sets out to understand how the propensity to move a more or less religiosuly segregated area has changed between 1981 and 2011. This will be achieved by accessing linked census data from the Northern Ireland Longitudinal Study (NILS) upon which negative binomial regression will be performed to disentangle age, period and cohort effects. The analysis will take place in three stages by firstly exploring how movements to more/less segregated areas vary as individual's age and progress through key life course phases. Secondly, assess whether Northern Ireland's two communities in the current era of peace and stability are continuing to grow apart at the same rate as in previous, more unstable years. Lastly, cohort analysis will be carried out to assess how one's birth cohort and relative experience of the violence has influenced their migratory behaviour, with comparisons made between pre and post 'troubles' cohorts.

## How well does registry data answer questions about migrant mental health? An analysis of author concerns from a scoping review.

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## Background

The increased availability of register data has led to a growing number of registerbased studies on migrant mental health. As part of a scoping review, we investigated the advantages and disadvantages of using registry data to answer questions in this research area.

### Methods

We used a scoping review methodology to search MedLine, PubMed, PsychINFO, Web of Science, and SCOPUS for all register-based studies on the mental health of migrants. Two reviewers screened all papers independently using gradually broadening inclusion and exclusion criteria for maximum 'scope'. Data were extracted in a charting exercise.

## Results

A total of 1309 papers were screened and appraised, 51 of which met our eligibility and quality criteria and were included in the review. We found that migrants were more likely to suffer from mental disorders and more likely to attempt suicide than their new country's settled population, but less likely to use psychotropic medication. Analysis into migrant use of health services yielded mixed results. The most common advantages reported by authors included large sample sizes and elimination of sample bias. However, the underreporting to re-migration and discrepancies in the coding of disorders were recorded as limitations in most studies.

### Conclusion

This review systematically charts the register-based studies on migrants' mental health for the first time. It discusses the ability of registry data to accurately assess migrant mental health, as informed by the authors of register-based studies.

# Local poverty dynamics: creating a small area indicator from administrative data

Mark Fransham

School of Geography & the Environment, University of Oxford

Small area indicators of poverty are widely used in UK social policy and research, primarily constructed from administrative data on benefit receipt. Despite the potential, there have been limited advances in developing the use of administrative data for the longitudinal measurement of small area poverty. This talk describes an indicator of local poverty dynamics – the local poverty exit rate - created for small areas (LSOAs) using housing benefit data for the Oxford local authority area between 2010 and 2014.

The local poverty exit indicator is strongly correlated with the cross-sectional official small area estimates and finds a remarkably high turnover of poor households. A higher probability of local poverty exit - and conversely a lower probability of local poverty persistence - was associated with living in a privately rented home, claiming a work-related welfare benefit, being a lone parent and having an adult in employment. The local poverty exit rate is able to identify LSOAs with higher and lower exit rates than the average for the city. This is primarily due to the differing composition of households by tenure within those areas - high exit rate areas having high concentrations of private rented housing.

The official cross-sectional poverty indicators reveal a relatively stable geography of poverty, leading to an unwarranted inference that the households who experience low income within a given area comprise a static group. The high local poverty exit rates discovered in this study suggest that it is the flows of people in and out of an area, and in and out of low income, that maintains the concentration of poor households, rather than a population of stubbornly poor households. Rather than concentrate on routes out of poverty, the most effective policy approaches in this area are likely to be those focused upon preventing routes into poverty.

## Prioritising dataset acquisition for large-scale research facilities

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The objective of the project is to apply natural language processing (NLP) methods to large literature databases in order to identify potentially emergent datasets for acquisition by the European Medical Information Framework (EMIF). The results were further analysed to select those with flexible data sharing agreements.

At present, there is a wealth of administrative datasets accumulated in large-scale databanks (such as the Secure Anonymised Information Linkage databank in Swansea University). While these have clearly been valuable for research purposes, complementary datasets may be required by collaborating researchers to answer more specific research questions about population health. Dataset acquisition is one of the most time consuming parts of research projects, which often operate on tight funding schedules.

Therefore, there is a clear need to be working towards the ability to pre-emptively acquire datasets so that these are ready for use before they present an immediate need to a researcher. This task can be captured by a number of broadly interesting research questions: Which of these datasets is worth its effort in acquiring?" "Which datasets have been acquired for use by researchers in external organisations?", "Which datasets cover the topics our organisation is interested in?", and "Which datasets have the broadest topic coverage?"

This presentation will report on the results of these preliminary scientometric analyses, which suggest that it is possible to identify emerging topic trends and prioritise dataset identification and acquisition.

# Welsh Government Flying Start Programme Evaluation Using Linked Data

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Flying Start (FS) is the Welsh Government's flagship Early Years programme for families with children aged less than 4 years of age. Running since 2006, the four entitlements are:

- Free part-time childcare for 2-3 year olds
- Enhanced Health Visiting
- Parenting support
- Speech, language and communication support

Currently, while we know which areas in Wales are receiving FS support, individuallevel data on which child received what entitlements is not available. This means that area-level outcomes can be used as proxy indicators but the individual impact of receiving FS support cannot be examined. This project describes the issues around collecting individual-level data in deprived Welsh regions and a pilot project to facilitate this collection.

A Dataflow Development Project (DDP) aims to install Secure Anonymised Information Linkage (SAIL) appliances into 5 pilot Local Authorities in Wales. The SAIL appliance technology will provide Local Authorities with the ability to link individual-level data within a Local Authority or between Local Authorities and to securely anonymise data into the SAIL Databank or ADRC-W.

The DDP will be aligned with the FS Pilot with the aim of acquiring the individual level FS data from pilot Local Authorities into SAIL and delivering analysis. Once linked to other administrative datasets in the SAIL Databank, a range of outcomes including health, education and social care will be analysed by level of engagement with FS to inform the evaluation of the FS programme in Wales.

## A new scaling approach to record linkage

Harvey Goldstein<sup>1,2,3</sup>, Katie Harron<sup>2,4</sup>, Mario Cortina-Borja<sup>3</sup>, James Doidge<sup>2,3</sup>

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With increasing availability of large data sets derived from administrative and other sources, there is an increasing demand for the successful linking of these to provide rich sources of data for further analysis. Variation in the quality of identifiers used to carry out linkage means that existing approaches are often based upon 'probabilistic' models, which can make heavy computational demands. Aside from recent Bayesian proposals that have limited practical application, some basic assumptions of existing methods are known to be flawed. In this talk we suggest a completely new approach to classifying record pairs in linkage, based upon weights (scores) derived from a scaling algorithm, that makes few assumptions and is intuitively appealing. The proposed method does not rely on training data, is computationally fast, and requires only moderate amounts of storage. An example comparing our method with traditional approaches will be given.

# Using longitudinal administrative data on employment history to identify poverty risks and social need

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Administrative data from the benefits and tax systems have been widely used in the UK to construct measures of social need (e.g. Free School Meals eligibility or Indices of Multiple Deprivation). These use cross-sectional indicators of current welfare benefits status but longitudinal measures capturing employment or benefit histories may provide more accurate measures of current needs. Such measures would have potentially wide-ranging applications in policy as well as research on the consequences of material deprivation.

The aim of this paper is to investigate how individual-level administrative data can be used to construct employment histories and whether such measures prove to be strong predictors of poverty risks. To construct individual employment histories, we use linked administrative data from welfare benefit records (DWP's 100% National Benefits Database) and tax records on annual earnings and employment episodes (HMRC's P14 and P45 data). These are further linked to survey data for a sample of adults who participated in the 2010/2011 Family Resources Survey and the follow-up 2012 Poverty and Social Exclusion UK (PSE-UK) Survey, providing a number of measures of poverty and deprivation. Measures of employment history from administrative data are compared to survey recall questions. We also explore how well these predict poverty outcomes, in comparison with survey measures of current employment status or benefit and tax credit receipt. Preliminary results indicate that the measures from longitudinal administrative data correlate with survey recall questions, and show the expected relationships with poverty risks.

# Long term illness and reported mental health conditions during recession: exploring evidence from the Scottish Longitudinal Study

Sarah Curtis, Jamie Pearce, Chris Dibben

### University of Edinburgh

This paper reports on a project which is underway to explore how local labour market conditions relate to reported mental illness and self-reported mental health conditions. The project aims to contribute to a growing body of research which seeks to relate changes in local socio-economic conditions over the lifecourse of places with changes in health over the lifecourse of individuals. The Scottish Longitudinal Study (SLS) provides a valuable resource for work of this type, since it relates to a large (5.3%), representative sample of the Scottish population, and is especially interesting for the work reported here in that it includes 2011 census data on self-reported mental illness, as well as reported long term illness data that were also collected in other parts of the UK. This paper reports on part of the work which has classified local authorities according to trends in employment rates and hourly pay 2006-2011, as indicators of the economic impact of recession, and on how this is being linked to the SLS and analysed in relation to the reported health outcomes of interest. This paper reports on part of the work which has classified local authorities according to trends in employment rates and hourly pay 2006-2011, as indicators of the economic impact of recession, and on how this is being linked to the SLS and analysed in relation to the reported health outcomes of interest. Analysis of growth trajectories of these economic indicators for local authorities in Scotland (derived from data published by NOMIS) demonstrates that the recession has tended to reinforce economic inequalities between some groups of local authorities and this project will examine whether there is evidence that this increasing inequality among places was significant for health inequalities.

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# Air pollution and cognitive development in children: pilot studies of methods and data linkage

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There is growing concern over possible detrimental impacts of air pollution on neurological development including cognitive function and behaviour in children. However, the evidence remains limited. Most studies to date have been relatively small, and their interpretation complex because of imprecision in exposure measurement, potential confounding and limited follow-up. To advance study methods, we are developing two nationwide pilot studies based on the Millennium Cohort Study (MCS) and the National Pupil Database (NPD), members of which are classified with respect to air pollution exposure by linkage to 1 x 1 km gridded annual average air pollution estimates. The MCS follows the lives of around 19,000 children born in the UK in 2000-01, and includes results of standardized cognitive/behavioural tests before school-age as well as, through linkage to the NPD, school attainment. Approximately 13,000 cohort members have been followed up at age 11 years. The NPD is one of the most detailed education database in the world and records histories of school attainment for all state school pupils in England (around 600,000 pupils a year). The use of MCS makes it possible to quantify the relationship between early life exposure to air pollution and subsequent cognitive development; to examine critical exposure periods (gestation, early life and/or school-age); to compare the air pollution impacts with other pre-natal/household factors; and to examine correlation between standardized cognitive measurements in the MCS and school performance. In both studies, cognitive outcomes, and change over time, are classifiable relative to population percentiles, and air pollution exposure by time-weighted average of concentrations at home and school. Major covariates include area socioeconomic status, quality of the school, ethnicity and siblings, as well as, for the MCS only, maternal characteristics, parent's education, and smoking in the home. Preliminary results will be presented with discussion of the lessons for record linkage and study design.

## Systematically corrupting data to assess data linkage quality

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Various algorithms have been developed to automatically link historical records based on a variety of string matching techniques. These generate an assessment of how likely two records are to be the similar. However, it remains unclear how to assess the quality of the linkages computed due to the absence of absolute knowledge of the correct linkage of real historical records – the ground truth. The creation of synthetically generated datasets for which the ground truth linkage is known to help with the assessment of linkage algorithms but the data generated is commonly too clean to be representative of historical records.

We are interested in assessing record linkage algorithms under different data quality scenarios, e.g. with errors typically introduced by a transcription process or where books can be nibbled by mice. We are developing a data corrupting model that injects corruptions into datasets based on given corruption methods and probabilities. We have classified different forms of corruptions found in historical records into four types based on the effect scope of the corruption. Those types are character level (e.g. an 'f' is represented as an 's' - OCR Corruptions), attribute level (e.g. gender swap - male changed to female due to false entry), record level (e.g. missing records due to different reasons like loss of certificate), and group of records level (e.g. lost parish records in fire). This will give us the ability to evaluate record linkage algorithms over synthetically generated datasets with known ground truth and with data corruptions matching a given profile. In this paper, we describe in detail these four types of corruptions and corresponding examples.

# The DASSL Model - Safe Sharing and Linkage of Data - Reflections one year on

Rosalyn Moran

Health Research Board, Dublin

The DASSL Model puts forward proposals for the types of infrastructure and services which can enable the safe sharing and linkage of research and related data in Ireland.

The model comprises seven elements – five related to infrastructure and services [a health research data hub, safe haven, trusted third party and data linkage service, output checking and disclosure control and a research support unit] required for safeguarding data, and two related to the broad legislative and socio-cultural context needed to facilitate implementation of the model i.e. governance and public engagement. The model is based on international best practice and can enable safe access and linkage of sensitive data. A report which presented the model was launched in Dublin in April 2016.

This paper will provide an overview of the model and an update on work towards its implementation. Recent research on the health research data hub element of the model and its possible forms will be presented.

Conclusion: It is argued that if we want a safe and trusted modern infrastructure that will enable researchers to unlock the significant value of currently underexploited data for the public good, then the DASSL model or a similar model needs to be implemented in Ireland.

Keywords: measures for safeguarding data, data linkage, trusted third party, safe haven, health research data hub, model

References: Moran, Rosalyn 2016. Proposals for an Enabling Environment for Health and Related Research in Ireland. A Discussion Document. Health Research Board, Dublin 2016 . http://www.hrb.ie/publications/hrb-publication/publications//709/

## Quality Assuring Linked Birth Registration and Hospital Episode Statistics Delivery Records – results and lessons learned

Gill Harper

City University

The linkage of birth registration and Hospital Episode Statistics (HES) maternity delivery records was carried out for the first time for the purposes of the 'Birth-timing and outcomes' project, which aims to analyse the daily, weekly and yearly cycles of birth-timings and their implications for child and maternal health and midwifery care and the NHS.

This linkage was undertaken by NHS Digital on ten years of data containing 6,676,912 registered births in England using an established algorithm on maternal identifiers. The nature of this algorithm creates a number of scenarios that include duplicate and incorrect linkages that need to be identified and removed before analysis can commence.

This paper sets out a quality assurance procedure built for this purpose. It consists of a set of deterministic sequential rules that compares all linked HES records for each birth and aims to identify the correct and most relevant link based on the most discriminatory matching infant and birth variables.

Singleton and multiple births are dealt with separately due to higher complexity with multiple births linkage. Bias is found between links that are retained and links that are broken. These are explained mostly by differences in data quality e.g. by year, by number of missing values, particular NHS Trusts that create duplicate records .

The linkage and quality assurance of these two datasets for such a large population reveals aspects of each dataset that otherwise would not be noticed, and aspects of the linkage algorithm itself.

The challenges and lessons learnt from this task are also discussed, which are relevant for the use with linkage of any large routinely collected administrative datasets.

# Alcohol outlet density and hospital admissions for alcohol-related injury: an electronic record-linked cohort study

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Background: Little is known on the longitudinal relationship between alcohol availability and the risk of admission to hospital for an alcohol-related injury. We aimed to quantify this relationship using observational record-linked data in a total adult population cohort in Wales, UK; population 2.5 million aged 16 years and over.

Methods: Data sources included licensed outlets held by the 22 local authorities in Wales under The Licensing Act 2003 for each quarter between 2006 and 2011. Alcohol outlet density was estimated for Census geography small areas (n=1896 divided into quintiles of equal counts) based on the mean network distances between each household and alcohol outlet. Hospital admissions 2006–2011 from the Patient Episode Database for Wales (PEDW) for wholly alcohol-related conditions were anonymously record-linked to the Welsh Demographic Service age-sex register within the Secure Anonymised Information Linkage databank. Injury admissions were defined by ICD-10 codes S00-99 & T00-19 linked to an alcohol code. Longitudinal statistical analysis used Cox regression models of hospital admissions as a function of outlet density at baseline, adjusting for confounding variables of age, sex and small area deprivation and settlement type, and censoring for death, migration and other cause admission.

Results: Alcohol outlet density at baseline was significantly associated with emergency hospital admission; the hazard ratio (HR) of an alcohol-related admission (n=25,722) for living in the highest compared with the lowest quintile of outlet density was 1.17 (95% CI: 1.11, 1.23). The risk was higher for alcohol-related admissions with injury (n=4,308; HR 1.27, 95% CI: 1.13, 1.42).

Conclusions: Higher alcohol outlet availability was associated with more emergency hospital admissions for alcohol-related injury. This suggests that restricting the density of alcohol outlets within walking distance from home may improve population health.

# Linking cohort data and routinely collected health data to enhance investigations into childhood obesity, asthma, infections, and injuries

Karen Tingay<sup>1</sup>, Amrita Bandyopadhyay<sup>2</sup>, Lucy Griffiths<sup>3</sup>, Ashley Akbari<sup>4</sup>, Helen Bedford<sup>3</sup>, Mario Cortina-Borja<sup>3</sup>, Jon Johnson<sup>5</sup>, Emla Fitzsimons<sup>5</sup>, Carol Dezateux<sup>3</sup>, Ronan Lyons<sup>4</sup>

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## Introduction

This paper describes the successful linking of routine health records with parental consent for Scottish and Welsh children participating in the UK Millennium Cohort Study (MCS) and some initial issues encountered in harmonising data sources from two different UK countries.

## Methods

Parental consent to link their children's data to routine health data was obtained from respondents to the MCS at the age seven year home interview for 12,736 of 14,043 (90.7%) children across the UK. Applications were made for linkage to multiple routine primary care, community, and hospital data sources through the NHS Wales Informatics Service (NWIS) in Wales and the Information Standards Division (ISD) in Scotland.

## Results

Linkage and acquisition of ISD data was a two-stage process taking approximately 18 months. Approval was obtained from ISD to link consented MCS cohort members to Scottish health records. A second application was required to then share the linked data with the project team.

NWIS data was already linked and held within SAIL, and work could commence processing and analysing the datasets as soon as Information Governance approval had been obtained.

The final study population, once inclusion and exclusion criteria had been applied was 1,431 Scottish and 1,839 Welsh children. Linkage rates between different health datasets ranged from 65.3% to 99.6%.

Linkage of cohort and routine health records enables planned epidemiological analyses of childhood obesity, asthma, infections, injuries and immunisations, as well as methodological studies to compare data quality from routine sources relative to parental report.

Conclusion

We have successfully linked cohort and routine data for 3,270 children drawn from a nationally representative cohort study. Lessons have been learned regarding the process and timeliness of data acquisition. Data harmonisation for research relevant to consented linkage studies will be discussed.

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# Increasing understanding of children's lives through linking survey and administrative data: the case of the Growing Up in Scotland study

Paul Bradshaw

ScotCen Social Research

The Growing Up in Scotland study is a large-scale, multi-cohort, prospective quantitative longitudinal research project following the lives of two groups of Scottish children: c5000 children born in 2004/05 (Birth Cohort 1) and c6000 children born in 2010/11 (Birth Cohort 2). The main sources of data are surveys of the cohort children and their parents; they are asked to complete electronic questionnaires and objective assessments at frequent intervals. The questionnaire data has been enhanced through linkage to a number of health and education administrative datasets. This linkage has allowed some unique analyses to be performed exploring topics of significant relevance to Scottish Government policy.

This paper will provide an overview of the Growing Up in Scotland study focussing in particular on the linked administrative data which is available to external researchers but is, as yet, relatively untapped. The paper will showcase an example of research already undertaken using these linked data. This research used administrative data provided by the Care Inspectorate and Education Scotland on the characteristics of pre-school centres attended by cohort children. This information was used, alongside the survey data, to explore children's varying experiences of pre-school in Scotland and the association between pre-school characteristics and children's cognitive, social, emotional and behavioural outcomes.

# The Child Mental health in Education (ChiME) Project: a novel cohort study of child mental health in schools using routine data

Louise Marryat<sup>1</sup>, Lucy Thompson<sup>2</sup>, Helen Sweeting<sup>3</sup>, Helen Minnis<sup>4</sup>, Phil Wilson<sup>2</sup>

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The development of good mental health in childhood is the foundation for healthy relationships, good mental and physical health throughout the lifecourse, increased educational qualifications, financial security and a range of other positive outcomes. Surprisingly little is currently known, however, about the pathways of mental health development through early and middle childhood. The ChiME project comprises the collection and linkage of child mental health data collected routinely in schools in Glasgow City. Data are collected on an annual basis at three time points: preschool (age 4-5), Primary 3 (age 7-8) and Primary 6 (age 10-11). The first two stages of data are completed by preschool staff and teachers, whilst the final stage is completed by the children themselves, giving a more objective view of child mental health than much of the current parent-completed data, which evidence has shown is coloured by the parent's own mental health. Data collection is unusually complete with virtually no attrition of the most deprived children.

To date, these data have been used to evaluate a city-wide parenting program, to investigate whether there are differences by schools and areas in child mental health in the city, independent of the home background of the child, and to explore the needs of Looked After children. Data are also fed back to primary schools and used in class planning, for example, whilst education services are able to use the city wide data for allocation of increasingly scarce resources.

This presentation will discuss the setting up of the collaboration between the University of Glasgow and Glasgow City Council Education Services to ensure high quality routine data collection and linkage, the challenges encountered, current findings and future proposals for this unique and exciting project.

# Pregnancy Spine – linking siblings in birth registration data

Julie Mills, Lynda Cooper

## ADRC-England

The presentations from ADRC-E (ONS) will give an overview of the investigatory work into producing a pregnancy spine from births registration data and present results about the quality of the linkage and how we may use this information to improve linkage projects in ONS.

Data relating to birth registrations is processed by and held in ONS. The project is to produce a pregnancy spine using births registration data. Elsewhere City University London has linked Maternity Hospital Episode Statistics (HES) data to birth registration and NHS Numbers for Babies (NN4B) for data years 2005 to 2014. We would like to expand the dataset, historically, by linking siblings to their mother using personal identifiers (NHS no for mother not available in ONS data pre-2005) on data pre-2005.

The initial investigation will be using live and still birth registration data for the years, 2000 – 2005. This data is unencrypted and available to specified people working in ONS only.

We will assess the quality of an administrative dataset assumed to be high quality by checking for consistency across and within variables, identify data error for example, missing variables, duplicate records etc. When processing the data compare to standard processing practice within ONS (DaaS) for example the elimination of all apostrophes in names.

We will assess the quality of linkage methods by linking siblings to their mother, using personal identifiers belonging to the mother - date of birth; country of birth; maiden/surname; first name; and second name of mother.

We will be able to clerically check matches and non-matches and develop matching techniques and if we achieve reasonable results then we can expand to include earlier years and investigate the possibility of linking in other sources of data such as HES maternity data and/or NPD.

## An Identifier Scheme for the Digitising Scotland Project

Özgür Akgün<sup>1</sup>, Ahmad Alsadeeqi<sup>2</sup>, Peter Christen<sup>3</sup>, Tom Dalton<sup>1</sup>, Alan Dearle<sup>1</sup>, Chris Dibben<sup>4</sup>, Eilidh Garrett<sup>5</sup>, Alasdair J G Gray<sup>2</sup>, Graham Kirby<sup>1</sup>, Alice Reid<sup>6</sup>

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The Digitising Scotland project is having the vital records of Scotland transcribed from images of the original handwritten civil registers . Linking the resulting dataset of 24 million vital records covering the lives of 18 million people is a major challenge requiring improved record linkage techniques. Discussions within the multidisciplinary, widely distributed Digitising Scotland project team have been hampered by the teams in each of the institutions using their own identification scheme.

To enable fruitful discussions within the Digitising Scotland team, we required a mechanism for uniquely identifying each individual represented on the certificates. From the identifier it should be possible to determine the type of certificate and the role each person played. We have devised a protocol to generate for any individual on the certificate a unique identifier, without using a computer, by exploiting the National Records of Scotland's registration districts. Importantly, the approach does not rely on the handwritten content of the certificates which reduces the risk of the content being misread resulting in an incorrect identifier. The resulting identifier scheme has improved the internal discussions within the project. This paper discusses the rationale behind the chosen identifier scheme, and presents the format of the different identifiers.

The work reported in the paper was supported by the British ESRC under grants ES/K00574X/1(Digitising Scotland) and ES/L007487/1 (Administrative Data Research Center – Scotland).

# A pilot ADRC-NI project linking Social Security Benefits to understand the health and social needs of disability benefit claimants

Aideen Maguire<sup>1</sup>, Dermot O'Reilly<sup>2</sup>, David Wright<sup>2</sup>, Ana Corina Miller<sup>2</sup>, Michael Rosato<sup>3</sup>, John Hughes<sup>4</sup>, Stuart Gilmore<sup>4</sup>, Siobhan Mawhinney<sup>4</sup>

<sup>1</sup>Centre for Public Health; <sup>2</sup>ADRC-NI; <sup>3</sup>Ulster University; <sup>4</sup>Department for Communities

## Background

Northern Ireland (NI) is one of the most disadvantaged parts of the UK, with high levels of disability and joblessness it is highly dependent on state benefits. In 2014 one-in-ten of the working-age population was receiving Disability Living Allowance (DLA), compared to one-in-twenty in Great Britain. Despite the high number of claimants there is a surprising scarcity of information about the health of DLA claimants and how this relates to disability in the wider community. In collaboration with the Department for Communities (DfC) this project will link the 2011 Census returns (with extensive disability and condition-specific health questions) to data relating to DLA recipients to better understand the types, severity and role of multiple disability amongst both DLA recipients and non-recipients and to inform policy especially around the implementation of the new Personal Independence Payment (PIP).

## Aims

The research is intended to answer three main research questions:

- To compare the types and severity of chronic conditions and the role of multimorbidity amongst Disability Living Allowance (DLA) recipients and nonrecipients;
- 2. To determine which conditions and combination of conditions are associated with employment amongst DLA recipients
- 3. To identify and estimate the individual, household and area-level factors impacting DLA uptake in NI

## Method

With funding secured from the ESRC's Secondary Data Analysis Initiative and approval gained from both the ADRN approvals panel and the Office for Research Ethics this project is underway with both the datasets and the Data Sharing Agreements in preparation. Preliminary results will be available by the time of conference in June 2017.

This research will offer fascinating insights into an important issue and the collaborative approach with researchers from Queen's University, Ulster University and the Analytical Services Unit (ASU) in the DfC will provide a significant benefit for both researchers and policy makers.

# Beyond the hype: Using story-telling to explore the use of data in local government

Emily Rempel, Julie Barnett, Hannah Durrant

University of Bath

New forms of data like 'big data' and 'open data' are increasingly common buzz words for the future of policy development in the United Kingdom and abroad. Despite numerous theoretical papers that discuss the potential for these kinds of data, there is limited evidence on the challenges of day-to-day use of new forms of data in policy. The aim of this study is to explore the practical catalysts and limitations of using data in local policy projects. This research used story completion exercises to examine data projects in the Bath and North East Somerset area of the United Kingdom.

Local policymakers, civic hackers, and 'armchair' data enthusiasts were recruited through an actor-network theory driven approach. A short story completion prompt was developed to explore how a theoretical community organiser, e.g. 'Sam', would access data in their local government. A story completion method was chosen as a way to probe opinions on the use of data that may be unpopular or in rare cases unethical. It was hoped that participants would finish the story prompt with how they thought a typical data project would run. Once this study's data collection is complete, the stories will be analysed thematically.

Early results suggest common themes around the necessity of being flexible in how local data is accessed, the key role of personal relationships to gaining access to data, as well as the role of data protection laws in limiting data sharing. Exploring the use of data in local government through story-telling offers an opportunity to better understand the current state of data use in local government. As well, this research will build on a growing body of literature around the influence of community organisations and individuals in the world of government data projects. Evaluating the impacts on health outcomes of Welsh Government funded schemes designed to improve the energy efficiency of the homes of low income households.

Sian Morrison-Rees<sup>1</sup>, Sarah Lowe<sup>2</sup>

<sup>1</sup>Swansea University; <sup>2</sup>Welsh Government

Living in a cold and/or damp house is known to increase the risk of morbidity, mortality and excess winter deaths. To reduce fuel poverty and its adverse health effects in Wales the Welsh Government developed programmes to improve the energy efficiency of homes. This includes the fuel poverty scheme called Warm Homes Nest. This scheme which was available to low income and vulnerable households in Wales from 2011 to 2015, provided energy efficiency measures e.g. insulation and heating upgrades such as a more efficient boiler, to enable them to maintain a warmer home.

At the 2016 ADRN conference we presented our aims and methodology of utilising data linking techniques to explore the impact of the Warm Homes Nest scheme on the health of recipients.

We have created a longitudinal dataset using the anonymised residential dwelling that has received home energy efficiency improvements linked to a summary of their health measures (hospital admissions, reason for the admission, GP prescriptions and clinical diagnoses).

We used a stepped wedge design to construct an intervention and control cohort for each year of the study period. We applied statistical techniques to conduct difference in difference (DID) estimations to compare any changes in the health of people before and after the intervention with any concurrent change in health in those who required, but had yet to receive, the intervention.

The statistical analysis is approaching completion and we will present results that explore the impact of the interventions on the health of the recipients, specifically focusing on general health and cardiovascular and respiratory hospital admissions.

The findings have the potential to inform more effectively focussed home energy efficiency schemes in order to reduce the numbers of people living in fuel poverty and thus improve the health and wellbeing of people living in Wales.

# Methods for measuring alcohol outlet density using administrative alcohol licence data and GIS

Richard Fry<sup>1</sup>, Jennifer Morgan<sup>2</sup>, Scott Orford<sup>23</sup>, Sarah Rodgers<sup>1</sup>, David Fone<sup>4</sup>

<sup>1</sup>The Farr Institute, Swansea University; <sup>2</sup>Cardiff University; <sup>3</sup>WISERD; <sup>4</sup>The Farr Institute, Cardiff University

We report on the relative merits of different methodologies for creating alcohol outlet density using administrative alcohol outlet licence data from Wales. Alcohol outlet density is a widely reported phenomenon with recent studies reporting on density measures from New Zealand (Cameron et al. 2015), Australia (Livingston 2014; Morrison et al. 2015), Scotland (Richardson et al. 2015), South Africa (Leslie et al. 2015) and the USA (Brenner et al. 2015; Cederbaum et al. 2015; Cook et al. 2014; Parker 2014). All of these studies measure alcohol outlet density using different methodologies; ranging from counts by geographical census unit (Cameron et al. 2015; Morrison et al. 2015) to more sophisticated Geographic Information Systems (GIS) based Kernel Density Estimates (Richardson et al. 2015). Outlet density is often measured using administrative geographies (Richardson et al. 2015) using official statistical population groupings to act as a proxy for where a usual population resides. In population based studies there are two general approaches in which a population denominator can be defined, through small area geographical aggregation (typically a census tract) or through an address based location (e.g. household level or postcode level aggregations).

We use a Bland-Altman plots to explore the differences in density scores calculated using different published density measures. Our results show that there are important systematic differences in density measures used, particularly when stratified by Urban-Rural classification and deprivation. This will allow the best selection of appropriate methods for calculating alcohol outlet density using administratively collected alcohol outlet licence data in Geographical Information Systems.

# Social factors influencing uptake of free eye examinations in Northern Ireland

David Wright<sup>1</sup>, Augusto Azuara-Blanco<sup>2</sup>, Dermot O'Reilly<sup>1</sup>, Ruth Hogg<sup>2</sup>

<sup>1</sup>ADRC-Northern Ireland; <sup>2</sup>Queen's University Belfast

Chronic eye conditions leading to vision loss significantly reduce the quality of life and increase the costs of care for older people. Progression of the most common sight-threatening conditions, age-related macular degeneration (AMD) and glaucoma can be slowed if detected early. However, there is evidence that social factors substantially influence detection programmes and here we present preliminary results from an ADRC-NI project investigating the influence of these factors on uptake of free examinations among the over 60s.

Individual uptake of eye examinations at community optometry practices over a five year period was measured using a dataset not previously used for research but accessible through the ADRC-NI, the Northern Ireland Business Services Organisation Ophthalmic database. This dataset was linked with the 2011 NI Census, which provided information on social context at the individual, household and area levels for a cohort of 295,000 individuals in 216,000 households.

64% of the cohort attended at least one test during the study period. Males were 17% less likely to attend than females. Uptake increased with age until the age of 80 and then declined among the oldest groups. Those with certain chronic health conditions (particularly cognitive impairment) were less likely to attend than those reporting good health. Very low uptake was observed among ethnic minorities indicating that these groups are either unwilling or unable to access these services in Northern Ireland.

At the household level, living with a spouse was associated with a modest increase in uptake as was provision of care to family members (a 15% increase in uptake for those providing the most hours of care). Finally, those with no car access or living in more remote areas were less likely to attend, indicating that transport difficulties constitute a key barrier to older people accessing these services.

We hope that these findings will inform the design of interventions to increase uptake of free eye examinations and so improve the ocular health of the aging population.

# The Supporting People Programme Study: the peaks, troughs and 'inbetweens' of data linkage

Sarah Lowe<sup>1</sup>, Donna Lemin<sup>1</sup>, Lucie Griffiths<sup>1</sup>, Laura McGinn<sup>2</sup>, Rhodri Johnson<sup>2</sup>, Robert Garlick<sup>2</sup>, Martin Heaven<sup>3</sup>

<sup>1</sup>Welsh Government; <sup>2</sup>ADRC-Wales, Swansea University; <sup>3</sup>The Farr Institute CIPHER, Swansea University

## Background

The Supporting People Programme is a Welsh Government initiative providing housing related support to vulnerable individuals to enable them to live as independently as they can. The programme aims to provide support as early as possible and helps over 60,000 people annually.

A data linkage feasibility study, completed in 2016 by ADRC-Wales, SAIL Databank, and Farr Institute (CIPHER) researchers, provided analysis on health service utilisation of those accessing Supporting People help from two Local Authorities in Wales. Findings indicate that for a number of groups of people accessing services there is a decline in health service utilisation so that by 12 months post-intervention, utilisation fell below the pre-support level. The feasibility study found that linking rates were high and there was sufficient use of health services, which led to funding of a wider programme of data linking.

## Objectives

The full data linking project aims to widen project scope through increased spatial coverage to the whole of Wales; exploring data linking to a wider array of administrative data (including social care, employment, criminal justice, homelessness, education and additional health data), and to use more rigorous analytical methods. This research aims to allow a deeper understanding of the programme impact, both at individual and population level, providing insight into the potential reduction of burden on a range of public services.

## Discussion

We discuss challenges and opportunities of aiming to acquire, understand and analyse this potentially rich and varied source of administrative data. Specifically we will cover the areas of: data acquisition and data sharing legalities; data standardisation; robust control group creation; setting relevant research questions and scope; appropriate statistical methods. We will report the findings of the feasibility study in terms of suggested reduced healthcare service utilisation following receipt of services; comparative analysis with one proposed control group will be presented.

## Linked datasets to model occupational mobility in Britain

Glenna Nightingale, Annemarie Ernsten, David McCollum

University of St. Andrews, Scotland, UK

The pursuit of job satisfaction and occupational mobility can be mired down by intertwining personal, societal and place based factors. In this study we reveal the contributory effects of these factors on occupational mobility in both Scotland and the UK as a whole. For analysis at the Scotland level, we use the Scottish Longitudinal Study (SLS) which has been linked the NHS Scotland postcode data dataset for the period 2001 - 2011 and for the UK as a whole, we use the British Household Panel Study (BHPS) and the UK Household Longitudinal Study (UKHLS) between the years 1991 to 2014.

This study innovatively combines various datasets to generate rich (timewise) data sources. The combination of the SLS and NHS Scotland data present a unique opportunity to assess the effect of migration on occupational mobility over 10 years. The combination of the BHPS and UKHLS datasets (with complex survey weights added in) affords a unique opportunity to investigate occupational mobility over a wide timeline of 24 years.

Key findings point to different occupational trajectories for males and females and the importance of geography (such as output areas), partnership status and household type in occupational mobility. Findings also indicate that the odds of experiencing positive occupational mobility were decreased after 2008 (recession year). Overall, these results are pivotal to an in-depth understanding of occupational mobility in Britain and are therefore valuable to policymakers and social scientists.

## **Outcomes following discharge from Critical Care**

Angharad Walters<sup>1</sup>, Ronan Lyons<sup>1</sup>, Damon Berridge<sup>1</sup>, Richard Pugh<sup>2</sup>, Ceri Battle<sup>3</sup>, David Hope<sup>3</sup>, David Rawlinson<sup>4</sup>, Tamas Szakmany<sup>5</sup>

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## Introduction

Measuring and understanding outcomes are vital to identify where resources need to be focused to provide safer care. This study builds on the limited data that currently exists on mortality risk factors for Critical Care survivors in Wales. This study determines the factors that increase the risk of mortality following discharge from critical care and determines health care utilisation before and after the critical care admission.

## Method

The SAIL databank was used to link Welsh Critical Care data, ONS mortality data, the Patient Episode Database for Wales (PEDW) inpatients data and the Welsh Demographic Service dataset. Details of patient care during the critical care episode along with patient demographics such as age, sex and socio economic factors were used in the survival analysis. The study included the first critical care admission for Welsh adult patients, who were alive at discharge between 2006 and 2013. For the survival analysis, patients were followed up to 1 year after discharge, outward migration or death; to measure health care utilisation, patients were also followed up during the year before the critical care episode. Results

The cohort included 40,631 patients discharged alive from critical care. Initial results show the estimate of the risk of death 1 year following discharge is 19.5%. Mortality risk factors include male sex, increasing age, increasing comorbidity score, increasing length of stay, unplanned admissions, being discharged in the evening and being discharged early due to critical care bed shortage. Initial work using inpatient data shows that health care utilisation is significantly increased during the post critical care follow-up time period when compared with the pre critical care time period. Conclusion

This analysis allows patients at greatest risk of death to be identified. Based on this analysis, discharging patients from critical care during the evening should be avoided.

## Incidence of conditions considered amenable to health care in Scotland

Megan Yates<sup>1</sup>, Ruth Dundas<sup>1</sup>, Jill P. Pell<sup>2</sup>, Alastair H. Leyland<sup>1</sup>

<sup>1</sup>MRC/CSO Social and Public Health Sciences Unit, University of Glasgow; <sup>2</sup>Institute of Health and Wellbeing, University of Glasgow

Mortality amenable to healthcare intervention are premature deaths (typically before the age of 75) which, theoretically, should not occur in the presence of timely and effective health care. Conditions which are considered amenable to health care include measles, breast and colorectal cancers, hypertensive disease, and asthma.

Rates of amenable mortality have previously been used to measure changes in health care systems' performance over time, or between countries. We aim to use this as an indicator of equity of health care in Scotland. A common criticism of using this indicator is the lack of consideration of disease incidence within the population; as variations in the mortality rates could be reflecting variations in rates of disease incidence, rather than variations in the equity of the health care system. By accounting for disease incidence in the population, more accurate measures of health care performance over time can be estimated. This research will highlight areas of the health system that could be improved, leading to improvements in population health.

Incident occurrences of amenable conditions were identified using linked hospital discharge (Scottish Birth, SMR01, SMR06 and SMR11) and death records of all amenable conditions within Scotland from 1996 – 2013. This enabled rates to be calculated for single and groups of conditions, as well as at different levels of deprivation.

Preliminary results show that whilst there is little difference in the absolute declines between incidence and mortality rates for each sex, relative declines in mortality rates are far higher than those in incidence (men: 41% vs 2.5%, women: 35% vs 1.5%). This suggests that declines in national rates of mortality amenable to health care intervention in Scotland are not driven by declines in hospitalisations; next steps will investigate whether such patterns differ between broad causes of death and deprivation groups.

# **Evaluating Population Data Linkage: Assessing stability, scalability, resilience and robustness across many data sets for comprehensive linkage evaluation.**

Özgür Akgün<sup>1</sup>, Ahmad Alsadeeqi<sup>2</sup>, Peter Christen<sup>3</sup>, Tom Dalton<sup>1</sup>, Alan Dearle<sup>1</sup>, Eilidh Garrett<sup>4</sup>, Alasdair J G Gray<sup>2</sup>, Graham Kirby<sup>1</sup>, Alice Reid<sup>5</sup>

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Data linkage approaches are often evaluated with small or few data sets. If a linkage approach is to be used widely, quantifying its performance with varying data sets would be beneficial. In addition, given a data set needs to be linked, the true links are by definition unknown. The success of a linkage approach is thus difficult to comprehensively evaluate.

This talk focuses on the use of many synthetic data sets for the evaluation of linkage quality achieved by automatic linkage algorithms in the domain of population reconstruction. It presents an evaluation approach which considers linkage quality when characteristics of the population are varied. We envisage a sequence of experiments where a set of populations are generated to consider how linkage quality varies across different populations: with the same characteristics, with differing characteristics, and with differing types and levels of corruption. The performance of an approach at scale is also considered.

The approach to generate synthetic populations with varying characteristics on demand will also be addressed. The use of synthetic populations has the advantage that all the true links are known, thus allowing evaluation as if with real-world 'gold-standard' linked data sets.

Given the large number of data sets evaluated against we also give consideration as to how to present these findings. The ability to assess variations in linkage quality across many data sets will assist in the development of new linkage approaches and identifying areas where existing linkage approaches may be more widely applied.

## Future vision for data integration

Becky Tinsley, Jon Wroth-Smith

### Office for National Statistics

In October 2014, the UK Statistics Authority published its strategy for UK statistics – 'Better Statistics, Better Decisions'. Bringing data together from a range of sources to enable analysts to deliver evidence-based policy making in a timely manner is at the heart of this strategy. An increasing number of data linkage projects are being carried out across the Government Statistical Service (GSS), linking administrative and survey data to deliver effective policy and to monitor its impact. Linkage work is also being carried out by the Admin Data Census Project and to improve statistical outputs.

The Digital Economy Bill, which is currently progressing through Parliament, makes provisions for data sharing. If passed, this should unlock some of the barriers that currently exist to enable a wider range of data to be shared and linked across Government. So how can the GSS ensure this is done in a consistent, coherent, secure and privacy-preserving way?

The Office for National Statistics (ONS) has been looking at a solution developed by Statistics New Zealand, known as the Integrated Data Infrastructure (IDI). This was implemented (with NZ Government support) to enable the delivery of better public services from improved capability across government to share data using existing datasets.

This presentation will discuss how such a system might be used to provide a consistent basis for delivering statistics, shaping policy and as resource for researchers. It will highlight how this system might be developed, using what ONS have already learnt about sources and methods from the work it is doing to transform its statistical production. In order to deliver the greatest benefit across the GSS and more widely, ONS will work closely with data suppliers, potential users and other stakeholders in designing and implementing such a model.

## How can we better understand internal migration?

Annemarie Ernsten<sup>1</sup>, David McCollum<sup>1</sup>, Zhiqiang Feng<sup>2</sup>, Dawn Everington<sup>2</sup>, Zengyi Huang<sup>2</sup>

<sup>1</sup>University of St. Andrews, Scotland, UK; <sup>2</sup>Scottish Longitudinal Study Development and Support Unit; Edinburgh University

Understanding migration behaviour is an essential part of understanding population change. Internal migration, although at least as important as international migration from academic and policy perspectives, has been less researched.

Recently the census based Scottish Longitudinal Study (SLS) has been extended to include postcode data from NHS Scotland. The SLS is a 5.3% sample of the Scottish population and is rich in attributes but the census is only repeated once every ten years. The data provided from NHS Scotland, however, covers very limited attributes but is rich timewise. NHS-data at postcode level is recently available through the SLS and this gives a unique and new opportunity to develop these data for longitudinal research.

The linkage of these data sources creates the potential to, for the first time, undertake an in-depth analysis of the mobility patterns of a sizeable cohort of individuals within Scotland, at detailed geographies and over a considerable period of time (2001-2011).

This paper will discuss the combination of health administrative data linked to the census based Scottish Longitudinal Study, which creates a new and unique way to study internal migration in Scotland. In our paper we evaluate the quality of this new data. By means of logistic regressions, we evaluated what movers and types of moves are under and over represented when combining these data sources. Finally, potential solutions to improve under/over representation in those groups are presented.

# Healthy Ageing in Scotland (HAGIS): Sample Design and Health-Related Response Bias

Elaine Douglas, David Bell, Alasdair Rutherford

University of Stirling

HAGIS is a robust feasibility study to establish Scotland's first longitudinal study of ageing. HAGIS will join the Gateway to Global Ageing Data Initiative (www.g2aging.org) – a platform for harmonised survey data on ageing to support cross-country analysis for research and policy. As such, HAGIS will develop a rich data infrastructure to support social and economic research and policy debate in Scotland and beyond. HAGIS has been able to incorporate an innovative sampling design and health-related response bias methodology owing to the availability and use of key administrative data. The sample design utilised NHS Central Register (NHSCR) data to screen eligible households from a random sample of addresses from the Postcode Address File (PAF). This enabled targeted, cost-effective recruitment of participants and avoided the inevitable, inherited response bias that is found when recruitment draws upon existing survey respondents. Health-related response biases are assessed by drawing comparisons between the health resource use of the Scottish population aged 50+ and the randomly selected PAF sample. Further, for those participants who consented to link their survey responses to NHS health records, this methodology is able to determine if this subsample are representative of Scotland as a whole in terms of its health care resource use. This methodology is able to highlight systematic differences between the HAGIS sample and Scottish population, and hence to enable the appropriate weighting of the sample to adjust for such response bias. No other global longitudinal study of ageing is able to adopt such methodology – unique features that have attracted interest and investment in this study. The sample design and health-related response bias process and outcomes, including successful NHSCR screening, survey response and consent to linkage rates, will be discussed.

## Applying machine learning to improve the accuracy of probabilistic linkage

Robespierre Pita<sup>1</sup>, Samila Sena<sup>1</sup>, Rosemeire Fiaccone<sup>1</sup>, Leila Amorim<sup>1</sup>, Mauricio Barreto<sup>2</sup>, Marcos Barreto<sup>1,3</sup>, Spiros Denaxas<sup>3</sup>

<sup>1</sup>Universidade Federal da Bahia (UFBA); <sup>2</sup>Oswaldo Cruz Foundation (FIOCRUZ); <sup>3</sup>Farr Institute of Health Informatics Research, University College London.

Record linkage refers to the process of comparing data from different sources and decide if they match (refer to the same entity) or not. This process is widely used in several domains to generate aggregated data to be used for different purposes, such as decision making, monitoring, and assessment studies.

Deterministic or probabilistic methods can be used for record linkage depending on the existence of key attributes common to all data sources involved. Probabilistic approaches pose a set of complex issues related to the choice of attributes, the technique to be used for matching decisions, and the accuracy of resulting data sets. The absence of gold standards to validate probabilistic linkage methods leads the user to the usage of manual review over dubious records (those not classified as true positives or true negatives), but this approach is limited by the amount of data to be considered and is subject to human error.

This paper presents an approach based on supervised and unsupervised machine learning techniques to improve the accuracy of probabilistic record linkage. We discussed recent results obtained within the "100 million cohort" project, a joint collaboration Brazil-UK started in 2013 to conduct a set of epidemiological studies concerning the assessment of health outcomes of individuals receiving cash transfer incomes.

We have performed tests using incremental samples from which we got very high accuracy results during the linkage process further validated through manual review. These samples were used as training data sets for our methods aiming to allow us to scale to 100 million records without the need of using manual review. We also plan to use these methods to perform probabilistic linkages within other two ongoing projects comprising a surveillance platform for Zika and microcephaly and some predictive analytical methods and data integration routines applied over Malaria data.
# A national demonstration project to link routinely collected social work and dental health data to investigate and enable monitoring of the health and healthcare of looked after children in Scotland.

Alex McMahon<sup>1</sup>, Lorna Macpherson<sup>1</sup>, Lawrie Elliott<sup>2</sup>, Katharine Sharpe<sup>2</sup>, Graham Connelly<sup>3</sup>, Ian Milligan<sup>3</sup>, Philip Wilson<sup>4</sup>, David Clark<sup>5</sup>, Albert King<sup>6</sup>, Rachael Wood<sup>5</sup>, David Conway<sup>1</sup>

<sup>1</sup>University of Glasgow; <sup>2</sup>Glasgow Caledonian University; <sup>3</sup>CELCIS; School of Social Work and Social Policy, University of Strathclyde; <sup>4</sup>University of Aberdeen; <sup>5</sup>Information Services Division, NHS National Services Scotland; <sup>6</sup>Scottish Government

Children that are 'looked after' include those that are accommodated in foster, kinship and residential care placements, as well as those at home on compulsory supervision. They have poorer physical and mental health than their peers and there are concerns about the relatively high levels of untreated morbidity. Oral health and access to dental services among Looked After Children (LAC) has received limited attention to date. Routine monitoring of the health outcomes of looked after children compared to those of their non-looked after peers is currently lacking. The objectives of this study was to compare the oral health and access to dental services of children who are looked after by the state, with comparable children in the general population; and to assess whether health and health care could be routinely monitored in this population.

School and Social Work datasets were able to be linked using the Scottish Exchange of Data (ScotXed) Unit. This in turn was linked with health data making use of the Scottish national record-linkage system provided by the NHS eDRIS team for the FARR Institute Scotland. All of the following datasets used in this study are complete national datasets for the time periods noted. School Pupil Census 2012: a census of children in local authority primary and secondary schools that provides each child's age, sex and socioeconomic status as measured by the Scottish Index of Multiple Deprivation (SIMD). The other datasets cover the period 2008-2012: LAC- all children with social work referrals for various types of placement; attendance at dentists; hospital discharge data for all episodes of tooth extraction; National Dental Inspection Programme (NDIP) data from Primary 1 and Primary 7 school years (dental decay). The LAC group were compared to their peers by logistic regression adjusted by age, sex and SIMD; using remote access to the National Safe Haven.

There were 633,204 subjects in the study group (10,927 LAC, 622,280 nonLAC). Ages ranged from four to 17 years (mean 12 LAC and 10 nonLAC); with n=5,815 (53%) male for LAC and n=316,719 (51%) nonLAC; and n=4,548 (42%) in the most deprived SIMD level for LAC and n=129,741 (21%) for non-LAC. The subjects in the LAC group were more likely to have dental decay at Primary 1, odds-ratio (OR) 2.65 (2.30, 3.05), and Primary 7, OR 1.79 (1.70, 1.92). LAC subjects were less likely to regularly attend a dentist, OR 0.55 (0.53, 0.58), and more likely to have teeth extracted, OR 1.91 (1.78, 2.04). All tests p<0.001.

Looked after children are more likely to have dental problems and less likely to access dental services than their peers, after adjustment for age, sex and socioeconomic status. This novel data linkage demonstrates the feasibility of monitoring population based health outcomes of school aged LAC and non-LAC groups using routine administrative data. Improved recording of the unique pupil identifier number on looked after data returns would be beneficial. Extending the range of personal identifiers on LAC returns would enable linkage to health data for looked after children who are not in school.

# The geographical and temporal variation of sold property prices using linked council tax valuations as a baseline

Chris Gale, David Martin

#### ADRC-England

Much administrative data linkage research focuses on linked individuals, but there are numerous instances in which contemporary policy questions demand linkage between address-referenced data, variously representing households, buildings and property. Address data sources confirm to a variety of standards and formats and there is an ongoing need to improve address linkage and its implications.

Council Tax levies are based on the value of residential property. In England properties range from Bands A (up to £40,000) to H (over £320,000). The assignment of bands is based on notional property values in April 1991. House price statistics, available from 1995, show regional and temporal variations in the prices paid for property. For example, Land Registry data show the average price of a property in the South East was £313,315 in July 2016, a 11.9% increase over the previous 12 months. This compares with an average price of £129,750 in the North East which corresponds to a 5.8% increase over the same period.

These regional and temporal variations in the housing market create regional mismatches between properties and their council tax banding. Linking council tax banding data (Valuation Office Agency) with sold property data (Land Registry) allows the spatial and temporal nature of these mismatches to be explored. Variation between property types can be analysed, along with the role, if any, of demographic characteristics by linking records to the 2011 Area Classification for Output Areas (2011 OAC).

This presentation describes the use of address-referenced property data to compare study areas in South East and North East England between 2011 and 2015, exploring the hypothesis that there is an increasing spatial disparity between the value of property and council tax banding. Finally, the policy implications of this analysis are examined by considering whether recalculation of council tax bands in England is necessary.

# **Record Linking Using Metric Space Similarity Search**

Alan Dearle, Graham Kirby, Özgür Akgün, Thomas Dalton

University of St. Andrews, Scotland, UK

Record linking often employs blocking to reduce the computational complexity of full pairwise comparison. A key is formed from a subset of record attributes. Those records with the same key values are blocked together for detailed comparison. Use of a single blocking key fails to detect many true matches if records contain missing values or errors, since only those records with the same key values are compared.

To address missing values, it is common to repeat the matching process using multiple blocking keys, to match records that are identical in a subset of the fields. The presence of erroneous values may be addressed by blocking using key values mapped to a canonical form (e.g. Soundex). However, this does not address other problems such as single digit transcription errors in dates.

Blocking is used to categorise records that are candidate matches, in preparation for a pairwise comparison phase which may use various distance metrics, depending on the domain of the values being compared. Each blocking process defines a partition of records. The comparison operations are only applied to pairs of records within the same category.

In some contexts, it may be useful to have flexible control over the precision/recall trade-off, depending on the intended use for the matched data, and the degree of conservatism required of the identified links. With blocking, this flexibility is limited by the number of sensible blocking keys that can be identified.

In this talk, we describe experiments with a technique based on similarity searching over metric spaces, which appears to offer greater flexibility, and describe some preliminary results using an historic Scottish dataset.

# Impact on pupil educational attainment due to individual or family health using linked data

James Healy, David Blackaby, Phil Murphy

### Swansea University

Using educational data from Wales, linked with GP and NHS data, we are examining the link between various mental and physical health episodes and how pupil educational attainment is impacted upon at Key Stage 1, Key Stage 2, and Key Stage 3, using Teacher Assessments of English, Mathematics, and Science.

At present we are working on methods to best group the health issues, and aim to use a variety of econometric methods to analysis cohort effects, with regression methods, such as propensity score matching, difference-in-difference, and pooled OLS.

This research has the potential to inform policy makers on how to best support youth mental and physical health, in order to minimise the impact on pupils.

This data is accessed through the ARDC site at Swansea University in their secure room.

# How to pool pseudonymized claims data from 6 European countries' healthcare systems

Florian Endel, Heinz Katschnig, Christa Straßmayr, Michael Berger

# IMEHPS.research

A main objective of the European FP-7 project CEPHOS-LINK is to investigate and internationally compare rehospitalization and health service interventions in adult patients, who have been discharged with a psychiatric diagnosis from hospital in 6 European countries.

In addition to detailed descriptions of the reimbursement and health care systems, administrative claims data is utilized to retrieve a deeper understanding of patients' pathways and factors influencing rehospitalization. Beyond distributed data analysis in each participating country, a pooled dataset is anticipated to enhance the population and the diversity of the cohort under observation. This opens up new possibilities like the integration of system level information in multi-level regression and dynamic simulation models.

Many technicalities have to be prepared, implemented and thoroughly documented to achieve a pooled dataset of acceptable quality during a project's lifetime. Considering applicable law and regulations, approvals from local ethics committees as well as individualized data protection and non-disclosure agreements have to be coordinated. Concurrently, secure data storage and processing facilities are prepared, documented and adjusted to each country's specific requirements. The concrete process including data preparation at remote facilities, encryption and secure transfer as well as local processing and documentation is outlined. Finally, a detailed description of the delivered datasets, including exact definition of formats, encodings and content while preserving ease of use and a maximum failure tolerance is prepared and executed.

All prerequisites and the pooling procedure itself have already been successfully accomplished. The transferred data provides new insights while the thoroughly planned and coordinated process works as a reliable foundation for handling this highly sensitive data. Nevertheless, complex difficulties are constant companions from the initial idea to the final results.

Pooling and analyzing claims data from different healthcare systems internationally turned out to be a complex but achievable and rewarding goal.

# Comparison of under-5 mortality in England and in Sweden using electronic birth cohorts from administrative linked data

Ania Zylbersztejn<sup>123</sup>, Ruth Gilbert<sup>13</sup>, Anders Hjern<sup>4</sup>, Pia Hardelid<sup>1</sup>

<sup>1</sup>UCL GOS Institute of Child Health; <sup>2</sup>The Farr Institute of Health Informatics Research; <sup>3</sup>ADRC England; <sup>4</sup>Centre for Health Equity Studies (CHESS) Stockholm University, Karolinska Institutet

# Background:

Under-5 mortality in England is almost two times higher than in Sweden. Policy makers need to know which interventions would be most effective at reducing child mortality rates to those of Sweden: addressing risk factors at birth (such as preterm birth or low birthweight), or improving care after birth. This study uses electronic birth cohorts to determine whether inter-country differences are driven by risk factors operating before or after birth.

# Methods:

We developed cohorts of singleton live births using Hospital Episode Statistics, linked to the Office for National Statistics mortality data in 2003-2012, in England, and using Medical Birth Register, linked to Hospital Discharge Register and Cause of Death Register in 1998-2012, in Sweden. We fitted Cox Proportional Hazards models to estimate hazard ratios (HR) for England versus Sweden for neonatal (2-27 days), post-neonatal (28-364 days) and early-childhood (1-4 years) mortality, excluding deaths on days 0-1 due to inter-country differences in registration practices. The models were adjusted for risk factors at birth (gestation, birthweight, gender, congenital anomalies), and socio-economic factors (maternal age and socio-economic status).

# Results:

The study cohorts comprised 3,940,168 births and 11,360 deaths in England and 1,436,211 births and 2,947 deaths in Sweden. The unadjusted HR for England vs Sweden in the neonatal period was 1.50 (95% Confidence Interval: 1.40-1.61). HR decreased to 1.02 (0.95-1.10) after adjusting for risk factors at birth, and to 0.99 (0.92-1.06) after further adjustment for socio-economic factors. In post-neonatal period the HRs were 1.50 (1.41-1.60), 1.11 (1.04-1.18) and 1.01 (0.95-1.08), respectively. In early-childhood the HRs were 1.21 (1.11-1.31), 1.04 (0.96, 1.13) and 0.98 (0.90, 1.07), respectively.

# Conclusions:

Differences in under-5 mortality in England relative to Sweden were primarily driven by a higher prevalence of risk factors at birth. Policies to reduce under-5 mortality in England should focus on health of women before and during pregnancy to reduce preterm birth, low birthweight, and prevalence of congenital anomalies.

# Persistently identifying administrative data: should we care?

Kakia Chatsiou

# University of Essex

Persistent identification is a good thing for all types of data collections used for research, as can uniquely reference source. This is particularly helpful in the context of secondary data analysis to ensure verifiability and applicability of research.

When it comes to operational data, it is hard to pinpoint what to 'uniquely' identify to be able to reference it for future research. Is it the extract that is created? Is it the live database where the operational data live? And what happens when research is based on administrative data linked from more than one sources?

The paper will present an overview of why persistent identification is an important step towards verifiability and better citation of data sources, as well as the challenges and opportunities around persistent identification of administrative data in a UK context. We will also be presenting some examples of international best practice and lessons learnt from similar challenges with similar types of dynamic data such as stream data.

# **GP** practices differences in COPD care in Hampshire

Sharon Lin<sup>1</sup>, David Culliford<sup>1</sup>, Matt Johnson<sup>1</sup>, Lynn Josephs<sup>2</sup>, Will Spackman<sup>3</sup>, Mike Thomas<sup>2</sup>

<sup>1</sup>NIHR CLAHRC Wessex, University of Southampton; <sup>2</sup>Faculty of Medicine, University of Southampton; <sup>3</sup>University of Southampton

This retrospective observational study evaluates the differences in quality of care to COPD patients in Hampshire General Practices and the outcomes of these patients. Quality care differences are measured by practice COPD audits, COPD Clinics, and the formal COPD training that practice staff, including GP's, Nurses and HCA's, have had. The study utilises multi-level modelling to evaluate individual level factors making up practice differences (e.g. patient age, gender, smoking status, and deprivation), as well as practice level services differences in care provisions and skill mix differences in staff.

A dataset of 16479 anonymised COPD patients in 155 practices was gathered from the Hampshire Health Record Analytical database (HHRA) containing details of 4 major outcome variables over a 2-year period; exacerbation, hospital admissions, A+E attendances and deaths. All 155 contributing practices were sent a questionnaire to gather necessary information on COPD care provision. 53 practices replied and the survey data was then evaluated in the multilevel modelling related to outcomes.

No significant differences were found between the GP practices that participated and did not participate in the survey in terms of patient demographic factors. Limited quality care provision differences were found among practices that participated the survey. There is, however, some evidence suggesting lasting positive effect of COPD audits on patient exacerbations.

The results of this study highlights differences in patient-level variables (e.g. age, gender, number of comorbidities, IMD level, and smoking status) that contribute to COPD patient outcomes. It also suggests that practice level COPD service provision may also have a significant impact on COPD patient exacerbation counts.

# UK Secure eResearch Platform - A Dementias Platform UK Data Portal Case Study

David Ford, Ronan Lyons, Kerina Jones, Simon Thompson, Christopher Orton

# Swansea University

The Dementias Platform UK (DPUK) Data Portal is a world-leading data analysis environment with accompanying tools that brings together data from 33 UK cohorts for collaborative translational research aiming to discover new interventions for dementias and enrich data focused research in the field of dementias discovery and care.

Led by Swansea University, the DPUK Data Portal is housed on an instance of UK Secure eResearch Platform, an infrastructure that brings a federated solution to sharing data in order to remotely manage and share dementias research data across the scientific community and provide state of the art integrated technologies for clinical, genetic, imaging and wearables data for the creation of an enriched epidemiological research community in dementias; also supporting large-scale experimental medicine and increasing data linkage capability.

Core datasets from DPUK are held in a data repository for access by bona-fide researchers in a remote environment, enabling high quality, secure research that is overseen and actively reviewed by the data providers themselves. Data can also be provisioned on a project to project basis and providers govern the access and analysis that are undertaken.

The availability of high quality data from specialist research cohorts on a single environment enhances the depth and richness of epidemiological studies based on existing data and subsequently creates ground-breaking and bespoke data and outputs for future highly targeted and efficient data research and interventions, whilst also supporting other research arms such as early phase trials and experimental medicine.

The Dementias Platform UK Data Portal has the capability for cross organisation projects that could introduce project specific data together in order to see the crossover of clinical dementias research and administrative and/or environmental factors associated with the disease, particular areas of interest for example could be combining cohort cognitive studies with education data, or socio-economic data.

# Defining identifiability under the new General Data Protection Regulation: what are the implications for the reuse of data?

Elaine Mackey<sup>1</sup>, Karen McCullagh<sup>2</sup>

<sup>1</sup>University of Manchester; <sup>2</sup>University of East Anglia

Identifiability is a fundamental concept in data protection: it determines whether data are considered to be within, or outside, the scope of data protection law and as such underpins decisions on data sharing and the reuse of data for research and commerce. More recently, there has been a move away from a simple binary interpretation of identifiability, from data that is identified or not to more nuanced approaches in both academic thinking and the law. Identifiability is now seen to be better understood (and indeed applied) if we imagine it lying on a continuum, at one end is identified data (considered personal data and thus within scope of the Data Protection Act (1998)) and at the other end anonymous non-identifiable data (considered outside the scope of the DPA) with degrees of identifiability in between. Indeed, the new General Data Protection Regulation 2016/679, which comes into force in May 2018, makes explicit the idea of variance between either end of the identifiability continuum through its introduction of the concept of pseudonymised data (personal data that cannot be attributed to a specific data subject without the application of additional information) which is considered neither directly identifying nor non-identifying. In this discussion paper, we apply to the concept of identifiability the notion of functional anonymisation (which asserts that one cannot determine if data are identifiable or not without reference to their context) and draw on the work of Polonetsky et al (2016) on degrees of identifiability to consider how under the GDPR 2016/679 data may be classed as within or out of its scope and what this might mean for data reuse.

# **Correlating Social Mobility And Economic Outcomes**

Maia Güell<sup>1</sup>, Michele Pellizzari<sup>2</sup>, Giovanni Pica<sup>3</sup>, José V. Rodríguez Mora<sup>1</sup>

# <sup>1</sup>University of Edinburgh; <sup>2</sup>University of Geneva; <sup>3</sup>Università degli Studi di Milano

We apply a novel measure of intergenerational mobility (IM) developed by Güell, Rodríguez Mora, and Telmer (2014) to a rich combination of Italian data allowing us to produce comparable measures of IM of income for 103 Italian provinces. We then exploit the large heterogeneity across Italian provinces in terms of economic and social outcomes to explore how IM correlates with a variety of outcomes. We find that (i) higher IM is positively associated with a variety of "good" economic outcomes, such as higher value added per capita, higher employment, lower unemployment, higher schooling and higher openness and (ii) that also within Italy the "the Great Gatsby Curve" exists: in provinces in which mobility is lower cross-sectional income inequality is larger. We finally explore the correlation between IM and several socio-political outcomes, such as crime and life expectancy, but we do not find any clear systematic relationship on this respect.

# The 'art' of cohort and study construction in administrative datasets: examples from Scotland

Lee Williamson

### University of Edinburgh

Using specific research case studies I will give an overview as to how as researchers we can have a great research idea, grounded in the relevant literature, but there are problems translating it into a robust research design. Assuming that the area/question cannot be reliably researched using small but rich sample surveys I will present ways in which routine admin data can help, along with the additional challenges of creating the correct cohort to address the research question.

The examples are from the Scottish Longitudinal Study (SLS) which links together routinely collected administrative data for a 5.3% representative sample of the Scottish population (about 270,000 people). It includes a wealth of information from the censuses (1991-2011), vital events registrations (ie births and deaths), and education data from 2007 onwards. The SLS with appropriate permissions can also be linked to health data such as cancer registry and hospital admission data from the NHS in Scotland. The size and scope of the SLS make it an unparalleled resource for analysing a range of socio-economic, demographic and health questions.

I will demonstrate how despite the large number of study members owing to the constrains on various admin data being available centrally for Scotland in systems (ie health data and education data) cohorts have to be carefully considered in order to research outcomes (events/results). Examples include: (1) life-course events for a cohort of SLS women born 1959-1965 followed up from 1991, (2) setting up 2 complex cohorts of SLS members and children of the SLS (COTS) born from 1991 onwards to investigate child development including social status information from family background, and (3) constructing relevant cohort samples to investigate those not in employment, education or training (NEET).

**Poster Abstract Number – 72, 73, 75, 76** presented by the Competence Centre on Microeconomic Evaluation (CC-ME)

# Administrative Data and Counterfactual Impact Evaluation at the Joint Research Centre of the European Commission – 4 Posters

Giulia Santangelo, Andrea Morescalchi

Competence Centre on Microeconomic Evaluation (CC-ME), Joint Research Centre (JRC)

In the posters, we will present the activities of the Competence Centre on Microeconomic Evaluation (CC-ME) of the Joint Research Centre (JRC). The CC-ME was launched in May 2016 with the aim of enhancing the use of causal impact evaluation and data-driven microeconomic analysis for policy, enlarging the vast experience of our Centre for Research in Impact Evaluation (CRIE). The CC-ME supports policy-making across a wide range of areas of impact evaluation of EU policies. It provides advice and capacity building on the use of Administrative data, data collection, evaluation design and counterfactual impact evaluation. It also provides infrastructures for evaluating knowledge management, in the form of (Micro) Data and Evaluations Banks.

In the first two posters, the presentation will focus on the support activities of the CC-ME for the several directorates of the European Commission in terms of policy evaluation. These include the contribution to the impact assessment of the Roam Like At Home (RLAH) regime, the support for causal impact evaluation of European Social Fund (ESF) interventions, the contribution to causal impact evaluation of higher education mobility (Erasmus) on career prospects of graduates in cross-national context, and the support for the interim evaluation of the Asylum Migration and Integration Fund (AMIF) and Internal Security Fund (ISF).

In the third poster, the presentation will show other research activities in the field of counterfactual impact evaluation based on Administrative data. Notably, CC-ME is collaborating on this with Member States, such as Ireland, as well as non-European countries, such as New Zealand.

In the fourth poster, it will present information on the forthcoming book on Administrative data for policy, promoted by CC-ME.

# The ELAStiC (Electronic Longitudinal Alcohol Study in Communities) project

Ashley Akbari<sup>1</sup>, Amrita Bandyopadhyay<sup>1</sup>, Mark Bellis<sup>2</sup>, Damon Berridge<sup>1</sup>, Frank Dunstan<sup>3</sup>, Annette Evans<sup>3</sup>, Daniel Farewell<sup>3</sup>, David Fone<sup>3</sup>, John Gallacher<sup>4</sup>, Vanessa Gross<sup>3</sup>, Jon Heron<sup>5</sup>, Matt Hickman<sup>5</sup>, Ronan Lyons<sup>1</sup>, John Macleod<sup>5</sup>, Liam Mahedy<sup>5</sup>, Shantini Paranjothy<sup>3</sup>, Giovanni Piumatti<sup>4</sup>, Karen Tingay<sup>1</sup>, Lazlo Trefan<sup>3</sup>, Yu-Chiao Wung<sup>3</sup>, Simon Moore<sup>3</sup>

<sup>1</sup>Swansea University; <sup>2</sup>Public Health Wales; <sup>3</sup>Cardiff University; <sup>4</sup>University of Oxford; <sup>5</sup>Bristol University

The ELAStiC project was established to determine factors that predict pathways into alcohol misuse and the life-course effects of alcohol use and misuse on health and well-being. This is achieved through accessing existing longitudinal data that are key sources of evidence for social and health policy, developing statistical methods and modelling techniques from a diverse range of disciplines, working with stakeholders in both policy, practice and the third sector, in order to bring together a diverse team of experts to collaborate and facilitate learning across diverse fields.

The project is linking data that include cohort studies such as; UK Biobank, ALSPAC (Avon Longitudinal Study of Parents and Children), Millennium Cohort Study, British Household Panel Survey, Understanding Society, E\_CATALyST (Caerphilly Health and Social Needs Electronic Cohort Study) and WECC (Wales Electronic Cohort for Children), and linked with routine data from primary and secondary healthcare in England, Scotland and Wales. Additional data from education and police data source will also be linked as part of the project.

The main work packages for the project are; Methodological Innovations, Pathways into Harm, Secondary Harms, Mental Health & Well-Being.

The results of the data linkage between the multiple cohorts and health, education and police data will be reported. The challenges of linking cohort and other data types from different nations will be discussed.

The issues surrounding UK wide data linkage and access are likely well known, especially involving numerous cohorts and countries. Our project has looked to deal with these limitations and delays by piloting methodologies.

Our project will aim to provide evidence that informs the UK Government's commitment to "radically reshape the approach to alcohol and reduce the number of people drinking to excess", by working with existing longitudinal data collected in the UK to inform policy and practice.

# Scottish Out of hospital cardiac arrest data linkage project; initial results

Nynke Halbesma<sup>12</sup>, Ellen Lynch<sup>2</sup>, Clarke Scott<sup>13</sup>, Dave Bywater<sup>4</sup>, Gareth Clegg<sup>13</sup>

<sup>1</sup>*Resuscitation Research Group at the University of Edinburgh;* <sup>2</sup>*Scottish Government;* <sup>3</sup>*Emergency Medicine NHS Lothian;* <sup>4</sup>*Scottish Ambulance Service* 

# Background

Previous results for survival after out of hospital cardiac arrest (OHCA) have indicated poor survival in Scotland. This has led a broad coalition of stakeholders to develop the Scottish OHCA strategy. This data linkage project will inform the strategy and provide insight into both short- and long-term survival. Furthermore, the results will provide a baseline for monitoring the effect of strategy implementation.

# Methods

All OHCA cases between 2011-2015 where resuscitation was attempted were identified from Scottish Ambulance Service data. The eDRIS team linked the OHCA cases to a range of administrative datasets based on Community Health Index (CHI) number where available or probabilistic linkage based on demographics and date of OHCA where CHI was absent. The data was stored and accessed through a Safe Haven.

# Brief results

Around 3.000 OHCA cases per year were identified with around 6.2% survival to hospital discharge. Of all cases 73.2% could be linked with other datasets such as the Unscheduled Care Datamart, hospital data (SMR01 and intensive care data), deaths data and SPARRA (comorbidities). This resulted in a rich dataset including a range of demographics, survival and clinical performance measures. Logistic regression models show that a higher age, male gender and living in a social deprived area are associated with a higher risk of an OHCA. Higher age and living in a rural or socially deprived area are associated with an increased mortality risk.

# Public benefit

The results of this data linkage are setting the scene for OHCA incidence and survival in Scotland. As this data linkage approach will provide insight in crucial elements of the 'Chain of survival', the results offer the opportunity to improve care delivery and survival after OHCA.

# Exploring child welfare inequalities through administrative data: linking the SIMD to Looked After Children and Child Protection returns

Jade Hooper, Marina Shapira, Brigid Daniel

#### University of Stirling

It seems long recognised by social work practitioners that there is a relationship between poverty and increased risk of children and families needing support through welfare intervention (e.g. becoming looked after or on the child protection register), yet evidence-based research in this area is lacking. A major contributor towards this absence may be due to the lack of data on family circumstances of those involved in child welfare systems. The annual government returns of Looked After Children and Child Protection statistics in Scotland contain no such information to facilitate this line of enquiry. However, individual Local Authority records contain the address details of clients engaged in these welfare systems. Following on from a pilot study in England, the current study requested Looked After Children and Child Protection returns from 10 Local Authorities in Scotland for the year 2014-15. Local Authorities were asked to include the data zone of origin or postcode details for individuals included in this data. This enabled the linkage of an area-based measure of deprivation (SIMD) to all children looked after or on the child protection register as a proxy for a family's socioeconomic circumstance. The study shows that the data linkage allowed the achievement of a better and more nuanced understanding of the factors contributing to welfare intervention. In particular, this data linkage showed that more information about the child's family circumstances (even on the level of neighbourhood) is crucial and should be collected and returned to the Scottish Government. Issues were encountered surrounding access concerns, missing data and errors or inconsistencies in records and formats, both between and within Local Authorities. Technical data handling and methodological issues surrounding this research design will be discussed, and implications of these for the broader study aims and future research considered.

# Generation Scotland : electronic health record linkage in practice

Archie Campbell, David Porteous

Generation Scotland, IGMM, University of Edinburgh

Generation Scotland: Scottish Family Health Study (GS:SFHS) is a family-based genetic epidemiology study of ~24,000 volunteers from ~7000 families recruited across Scotland between 2006 and 2011 with consent for follow-up through record linkage and re-contact.

Participants completed a demographic, health and lifestyle questionnaire and provided biological samples including DNA, and 90% underwent detailed clinical assessment. The samples and data collected form a resource with broad consent for research on the genetics of health. Features include the family-based recruitment; breadth and depth of phenotype information, with detailed data on cognition, personality and mental health. GWAS and exome genotype data is available on most of the cohort. These maximise the power of the resource to identify, replicate or control for genetic factors associated with a wide spectrum of illnesses and risk factors. By linkage to routine NHS hospital, maternity, lab tests, prescribing, mortality and dental records this has become a longitudinal dataset, using the Community Health Index (CHI).

Researchers can use linked datasets to find prevalent and incidental disease cases, and healthy controls, to test hypotheses on a stratified population. Expert working groups have been set up to further annotate data and co-ordinate research in the fields of genomics, cognition, mental health and chronic pain.

GS has now established and validated eHR linkage, overcoming technical and governance issues in the process. There are current or planned collaborations looking into heart disease, diabetes, breast and colon cancers, depression, neuropathic pain, Alzheimer's disease and dementia. Generation Scotland have thoroughly tested the linkage process and plan to extend it to include primary care data (GP records) in the next year. There are plans to extend the cohort and collect more samples and data. The GS resources are available to academic and commercial researchers through a managed access process (www.generationscotland.org).

Evaluating health, economic and social outcomes of patients treated by the Emergency Medical Retrieval and Transfer Service (EMRTS) Cymru: A 3-year data-linkage study.

Jane Lyons<sup>1</sup>, David Rawlinson<sup>12</sup>, Richard Fry<sup>1</sup>, Damon Berridge<sup>1</sup>

<sup>1</sup>The Farr Institute, Swansea University; <sup>2</sup>NHS Wales

# Introduction

The Emergency Medical Retrieval and Transfer Service (EMRTS) Cymru launched in April 2015. Consultants trained in pre-hospital emergency medicine and critical care paramedic practitioners provide air ambulance delivered advanced decision making and critical care for life threatening injuries and emergencies. The aim of this study is to evaluate the impact of EMRTS on survival, health-related quality of life (HRQoL) and functional status as well as the downstream effects on health care utilisation.

# Method

The evaluation will use data linkage techniques through the Secure Anonymised Information Linkage (SAIL) databank. Year one established the system and various data flows necessary for the evaluation, including acquisition of two national audit dataset from intensive care (ICNARC) and trauma (TARN) and routine ambulance and clinical datasets. Year two will focus on refining the case-control methodology where selected EMRTS cases will be matched with historical and contemporaneous controls based on similar diagnoses, distance/time from hospital and severity metrics. Sentinel diagnoses of time critical injuries and illness will be used in the case-control study. EMRTS survivors will be followed up to record HRQoL and functional status (GOS-E), and compared with similar services operating in Victoria, Australia.

# Results

In year one, 1285 patients were seen; 92% as emergencies and 8% hospital transfers. Incidence was highest in rural areas. Analysis is continuing; key findings to be reported include: metrics of equity of access and timeliness to specialist care; functional outcomes; changes in mortality, length of hospital stay, and NHS resource use and costs.

# Conclusion

This completed evaluation will provide evidence for the degree of effectiveness of time critical interventions for severe trauma and life threatening conditions.

What's so great about administrative data? A reflection on administrative data and the value of collaborating datasets for research.

Erin Early

Queen's University Belfast

Administrative data is of vital importance to researchers as the rigorous stages of testing it is subjected to provide a concrete foundation to inform community organisations and public policy.

My PhD project highlights the value of administrative data as it is using the first dataset in Northern Ireland that combines the School Leavers Survey and Census. This combination provides the opportunity to explore individual factors through the School Leavers Survey, in addition to analysing wider influences of family characteristics through the Census, to provide a comprehensive explanation of why some students conform to higher educational expectations at GCSE level than their peers from the same religion, residential locality and socio-economic status. The use of administrative data provides the opportunity to explore the interaction of gender, religion and deprivation to break down the widely cited problem of "Protestant working class boys" to consider when other factors are added to the relationship, does it exacerbate the problem.

Drawing upon my own experience, this session will discuss the value of administrative data and importance of collaborating different datasets to provide more inclusive data that would allow informed conclusions to be drawn from the results of the study to inform decisions in the public sphere. This will be directed at both novice researchers and also those more experienced to provide a greater insight into the process of collaborating datasets, drawing upon the importance of elements such as matching and receiving clearance from relevant organisations to allow their data to be shared and used in this way, whilst also acknowledging potential drawbacks.

# An Investigation into the Impact of Disability on Employment in Wales

Aideen Ahern

Swansea University

Disability is strongly related to employment disadvantage (Berthoud, 2008). There is a scarcity of disability research within labour economics, therefore this project will add to the evidence gap by examining existing survey data linked to medical administrative data provided through the ADRC Wales.

The project examines the relationship between self-reported disability from the NSW (2012-15) and health records from the Patient Episode Database Wales and GP event data. While social and economic disadvantage associated with disability is frequently identified using self-reported information on disability in survey data, far less is known within social science about the medical history/conditions of these individuals. The differences in objective health indicators, such as number of Hospital activity between those who currently self-report disability (limiting long-standing illness), and those who do not is investigated. In addition, we will explore the effects that disability status has on employment status within Wales.

As part of a wider empirical investigation into the influence of disability on economic outcomes using survey data, we examine the additional value of linked data. This analysis of linked data is aimed to form an initial exploratory project to identify the potential benefits and limitations of data linking in this context. The work aligns closely with the Welsh Government Programme to Maximise the Use of Existing Data which seeks to explore how the Welsh Government can potentially use linked data to improve the evidence base for policymaking. The findings will feed into the evidence base relating to the Programme for Government. This projects hopes to increase the understanding of the relationships between disability and employment, to further inform policy makers and to create awareness among researchers of the benefits of using linked data.

Adding contextual admin data to the ons longitudinal study for england and wales: the example of house price data

Adam Dennett, Oliver Duke-Williams, Nicola Shelton

CeLSIUS Team, University College London

The ONS Longitudinal Study is a complete set of census records for individuals, linked between successive censuses, together with data for various events. It relates to a sample of the population of England and Wales.

The sample comprises people born on one of four selected dates of birth and therefore makes up about 1% of the total population. The sample was initiated at the time of the 1971 Census, and the four dates were used to update the sample at the 1981, 1991, 2001 and 2011 Censuses and in routine event registrations. Fresh LS members enter the study through birth and immigration and existing members leave through emigration or death, however their data is retained.

Thus, the LS represents a continuous sample of the population of England and Wales, rather than a sample taken at one time point only. It now includes records for over 950,000 study members.

In addition to the census records, the individual LS records contain data for events such as deaths, births to sample mothers, emigrations and cancer registrations.

Census information is also included for all people living in the same household as the LS member.

To add context to the dataset we will link to the Land Registry Price Paid dataset. This is an open, address-level dataset, which records the price paid in residential transactions between 1995 and the present day. This will enhance studies of migration and also provide a contextual wealth variable in conjunction with the household tenure.

# 'Ten shades of grey': an intersectional analysis of gender and poverty on child health care utilisation in India

#### Luciana Brondi

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### Background

In South Asia, gender based discrimination might affect child health care utilisation, including care seeking behaviours for potential fatal infections. I aimed to determine the whether gender and poverty affected care seeking for diarrhoea in children in India.

### Methods

Data from the latest Indian Demographic and Health Survey (DHS 2005-06) was used. The combined effect of gender and wealth on care seeking was assessed using an intersectional approach, using a multivariable logistic regression model adjusting for other potential effect modifiers.

### Results

The analysis included 4,440 children with diarrhoea, where lower prevalence of care seeking outside the home for diarrhoea was significantly associated with being a girl (AOR, 0.84; 95% CI, 0.72-0.99), or belonging to a poorer family (P values varying from 0.024 richer vs. richest to 0.000 poorest vs. richest). Further association analysis using a heuristic intersectional model suggests that boys tend to be less affected by family economic status than girls in terms of care seeking. Boys in the richest quintile were significantly more likely to receive appropriate care seeking than girls in the poorest boy this difference, although still significant, is smaller, with AOR of 2.55 (95%CI 1.61 to 4.07). Similarly, when compared to richest boys, girls in the richer quintile were significantly less likely to get appropriate care seeking with AOR 1.96 (95% CI 1.28 to 3.01), whilst for boys in the same richer quintile this difference was not significant (AOR 1.42 (95%CI 0.96 to 2.13)).

#### Conclusions

These results suggest that in terms of care seeking for diarrhoea, girls tended to benefit less from economic advantage when compared to boys. In South Asia poverty effects on health inequality might be influenced by gender. In such settings, data analysis and policy initiatives targeting access to health care should be gender sensitive.

# Linking health and school pupil census data to investigate the role of ethnicity and socioeconomic factors in relation to dental health among children in Scotland

Ahmed Mahmoud<sup>1</sup>, Alex McMahon<sup>1</sup>, Hester JT Ward<sup>2</sup>, Albert King<sup>3</sup>, Jamie Kidd<sup>1</sup>, Lorna MD Macpherson<sup>1</sup>, David I Conway<sup>1</sup>

# <sup>1</sup>University of Glasgow; <sup>2</sup>Information Services Division, NHS; <sup>3</sup>Scottish Government

Recent data show steady progress in child oral health in Scotland. However, inequalities remain in relation to socioeconomic deprivation, with children from the poorest backgrounds having the greatest burden. More anecdotally, there are also concerns in relation to the oral health of children from black and minority ethnic community backgrounds (BME) – although there are no routine data or recent studies to examine this area in Scotland.

A series of cross-sectoral (education and health) data linkage cohorts are being built to investigate ethnicity and socioeconomic factors separately and in combination with child dental health and dental service data. Records from the National Dental Inspection Programme (NDIP - 2008/2015) and ethnicity data from the national school pupil census (ScotXed) are the prime data sources. A categorisation method was applied to personal identifiers from NDIP and ScotXed in order to attach a NHS Scotland community health index number (CHI); this number is unique to each child and is used in linking all the child records from different datasets.

Records from ScotXed were matched to the national CHI database; out of 784,463 children on the ScotXed, there were 764,537 (97.5%) and 19,926 (2.5%) considered to be matched and non-matched, respectively. NDIP data from years 2008 to 2015 contained 383,058 basic dental inspections for Primary 1 (5-year-old) children, of which 380,072 (99.2%) were considered to be matched, while 2,986 (0.8%) were non-matched. Similar figures are observed for NDIP Primary 7 (11-year-old) children inspections: 359,717 (99.2%) and 2,792 (0.8%) were considered to be matched, respectively.

These encouraging data linkage success rates indicate the further feasibility of crosssectoral data linkage to establish a set of comprehensive cohorts which contain more detailed sociodemographic background on individuals. These will be use to examine children from BME groups' experiences in relation to oral health, dental service access and uptake, and the impact of Childsmile – the national oral health improvement programme in Scotland.

# The Anonymisation Decision-making Framework

Elaine Mackey<sup>1</sup>, Mark Elliot<sup>1</sup>, Kieron O'Hara<sup>2</sup>

<sup>1</sup>University of Manchester; <sup>2</sup>University of Southampton

This poster sets out the anonymisation decision making framework, a new holistic approach to anonymisation that provides an end to end methodology for assessment of risk and control of re-identification which incorporates legal, ethical, policy and statistical insights. The framework has been developed in the context of the current UK regulatory environment (primarily the Data Protection Act 1998) and here we also consider its value in interpreting the New General Data Protection Regulation 2016/679.

# Westminster City Council's Problematic Premises predictive tool that provides insight and optimises allocation of resources.

Sophie Johnson, Joanne Lodge

# Westminster City Council

As one of the busiest boroughs in the country, it is essential that Westminster City Council makes the best use of its abundant administrative data to make more impactful use of its resources. In the past, data from different services have been silo-ed; both technically (in separate, unconnected databases) and culturally (through a fear of data sharing). Business Intelligence is now being used to link these datasets to identify new insights and improve performance.

The 'Problematic Premises' predictive tool provides insight at a property level by joining together 60 datasets, including internal administrative and external open data. Using knowledge from front-line workers in the City Management and Communities service and machine learning analysis from the Greater London Authorities (GLA) data science team, each dataset was weighted depending on how it contributes to a premises being problematic.

In the first instance two weighted models were created to identify problematic licensing premises and Houses of Multiply Occupancy (HMOs). The most 'problematic' premises are ranked highest and are prioritised for visits by Westminster's city inspectors.

The advantages to this approach are:

- Tracking properties movement up the ranking enables inspectors to intervene early to prevent premises from becoming problematic
- Moves away from a reactive workforce to enable intelligent deployment of resources
- Fits into new non-silo approach to tackling anti-social behaviour
- Data protocols have been established to enable officers to see a holistic view of a property
- Addresses statutory obligation for Local Authority to periodically check privaterented residential properties
- Supports Public Health priorities such as early intervention, Care Act, helping people to stay in their homes longer, Strategic Needs Assessment

Future aspirations are to add models to the tool to help other priorities such as identification of potential short terms lets, problematic commercial premises and to plan food premises inspections.

# Preserving the confidentiality of information

Ian Craig<sup>1</sup>, Emma Kelly<sup>2</sup>

<sup>1</sup>ADRC-Northern Ireland Research Support Unit (RSU); <sup>2</sup>Business Services Organisation (BSO), NISRA

Preserving the confidentiality of information given to the Administrative Data Research Centre Northern Ireland (ADRC-NI) is absolutely paramount. Such work is underpinned by a variety of important Information Assurance protocols and safeguards in accordance with the '5 safe principles'. In NI these include, for example, the linkage of datasets by the Northern Ireland Statistics and Researcher Agencies (NISRA's) independent trusted third party and associated processes implemented by NISRA's Research Support Unit (RSU) which, together, help to ensure that directly identifying information is never made available to researchers. From a RSU perspective, the presentation will provide an account of the various processes involved from the time of the initial application stage through to the signing of the necessary Data Sharing Agreement (DSA), the matching and linking of the data and the provision of the de-identified dataset in NISRA's supervised secure environment. The presentation will also provide insight from a data custodians' perspective through the experiences of the Business Services Organisation (BSO) who have provided data for a number of ADRC-NI projects which they considered worthwhile. These experiences will include clarification of the variables to be provided, signing of the DSA and the transferring of de-identified data to NISRA's ADRC-NI RSU.

# Who are the Laggards and the disengaged - address accuracy of NHS registration data

Melissa Randall, Jim Newman, Rebecca Jathooni, Cassie Hayter

# Office for National Statistics

NHS registration data has many uses in ONS. This presentation addresses questions of quality and use of NHS registration data: Who is not registered at the same address on NHS records and the Census? How long is the registration lag for different demographic groups? Who never registers? Are some areas worse than others for discrepancies? Should we be worried about students, men or migrants? Are registration 'trends' changing?

Analysis linked the Longitudinal Study - the longitudinally linked Census data representing 1% of the population - with NHS registration data and postings information which shows ongoing changes to administrative data. It looks at two cohorts, from 2001 Census and 2011 Census, and shows how many people were at the same address in the Census and their NHS registration. Of those who weren't, how long it took to register at the Census address. The 2001 cohort is then checked again at the 2011 Census.

# Establishing Safe and Efficient "Read-through" Indexes for Scottish Informatics and Linkage Collaboration

Dave Clark<sup>1</sup>, Gerry Donnelly<sup>1</sup>, Albert King<sup>2</sup>, Ken Humphreys<sup>1</sup>

<sup>1</sup>National Records of Scotland; <sup>2</sup>Scottish Government Education Analytical Services

The Scottish Informatics and Linkage Collaboration (SILC) uses privacy enhancing linkage methods to enable data linkage for research that maintains and strengthens public confidence. National Records of Scotland (NRS) provide the Trusted Third Party (TTP) Indexing Service on behalf of SILC. The role of NRS is to match the personal identifiers submitted by data controllers to the national research spine and generate study and dataset-specific index numbers. These indexes are used to link pseudo-anonymised records accessed by approved researchers in a safe haven.

NRS are developing a series of "read-through" index keys, which can be re-used and facilitate safer and more efficient data linkage. The approach maintains and enhances existing privacy safeguards including avoiding the need to retain linked research datasets.

# The Following Abstracts were submitted to ADRN2017 but were unable to attend to present

Abstract Number - 4

# Lone parents, time-limited in-work credits and the dynamics of work and welfare

Mike Brewer<sup>1</sup>, Jonathan Cribb<sup>2</sup>

<sup>1</sup>University of Essex; <sup>2</sup>Institute for Fiscal Studies

Time-limited in-work credits are cheaper, and more targeted, than conventional inwork credits, but are thought to have small to zero long-term impacts. We study two time-limited in-work credits introduced in the mid-2000s in the UK and find they reduced welfare

participation and increased employment. We estimate the impact of these programs using rich administrative

data on lone parents' spells on welfare and in employment (the Work and Pensions Longitudinal Study, owned by DWP), and a multi-state, multi-spell discrete time duration model with unobserved heterogeneity. Both policies increased job retention once recipients were in work and boosted employment even after the payments were stopped. Conditioning on hours of work was important. Paying a credit to those working 16+ hours a week only increased part-time work, while conditioning on fulltime work reduced part-time work and increased full-time work.

Understanding variations in the trajectories of academic achievement and mental health service utilization of adolescents who migrate to Canada: A population-based cohort study

Monique Gagné PhD, Jennifer Shapka PhD

University of British Columbia

Objectives. The aim of the study was to examine variations in the academic achievement and mental health service utilization of foreign-born adolescents in British Columbia (BC), Canada, and to subsequently identify predictors of this variation. The objectives of the study were to (a) characterize the academic achievement and mental health service utilization trajectories of foreign-born adolescents over the course of high school, (b) identify assets and risks predicting their academic achievement and mental health service utilization trajectories, and (c) identify the relationship between academic achievement and mental health service utilization.

Approach. Leveraging administrative data from the BC Ministry of Health, BC Ministry of Education, and Citizenship and Immigration Canada, the study looked retrospectively at a population-based cohort of foreign-born adolescents in BC over the course of their high school years (Grades 10-12), in comparison to a random sample of their Canadian-born peers.

Results. Utilizing Group-based Trajectory Modeling, the study identified that foreignborn adolescents in BC followed a range of academic achievement and mental health service utilization paths. By way of multinomial logistic regression, the study subsequently identified a number of assets and risks that helped to explain the odds of membership in each trajectory group. Finally, utilizing dual trajectory modeling, the study found a relationship between academic achievement trajectory group membership, conditional upon mental health service utilization group membership.

Conclusion. As expected, a number of assets and risks as well as cumulative assets and risks associated with migration experiences were found to be powerful predictors of the variation in academic achievement and mental health service utilization for foreign-born adolescents in BC. The results support moving away from a one-size-fitsall understanding of the impact of migration on adolescent development. The utility of contextualizing migration experiences to gain a better understand of who is most likely to struggle or succeed is discussed.

Exploiting the coverage of administrative data to understand changing criminal careers and the causes of the crime drop: exploring conviction patterns in the Scottish Offenders Index, 1989-2011

Ben Matthews

University of Edinburgh

The status of the Scottish Offenders Index (SOI) as a census (n=all) of conviction proceedings in Scotland allows the adoption of research designs that would be prohibitively costly and time consuming to implement with more traditional survey approaches. This paper argues that this flexibility, combined with the large time span covered by the SOI (1989-current), provides a way to bridge the typical individual (micro-) focus of developmental criminology and the (macro-) analysis of aggregate crime rates. Specifically, by examining conviction patterns for multiple cohorts across multiple years, inferences can be made as whether the recent falls in aggregate conviction rates are most plausibly explained by period or cohort effects. In turn, this distinction between period and cohort effects can both suggest which potential explanations for these recent falls in conviction rates in Scotland are most feasible – thus helping to refine explanations for the recent 'crime drop' – as well as helping to draw inferences about the factors leading to change in criminal careers over time. To support these claims, this paper presents the results of an exploratory analysis of change in convictions patterns in the SOI between 1989 and 2011.

# Health, social care and multimorbidity: the role of social inequality

Paul Henery

# University of Stirling

Inequality is a prominent predictor of poor health (Eibner & Evans 2005) and may have a greater effect on older people. In Scotland, those aged 65 and above comprise 18% of the population with this predicted to increase (Scottish Government 2014) and more than half have more than one chronic condition (multimorbidity). Efforts have been underway to integrate health and social care under one joint authority – the aim of this study is to examine inequality regarding the effect of provision of social care on the health outcomes of older people with multimorbidities.

Following a literature review, it was found that is likely that multimorbidities occur earlier and in greater number (Orueta et al 2014) in deprived areas, in part due to such things as an inability to balance multiple appointments with a hectic personal life (O'Brien et al 2011). The prevalence of individual conditions such as dementia was also assessed (Innes et al 2006). There was a lack of evidence regarding social care in deprived communities.

This study uses a linked dataset (developed by the Scottish Government) of linked health, social care and prescription data. The Scottish Index of Multiple Deprivation (SIMD) will be used to measure inequality. Those whom are 65 or over, resident in Scotland and in receipt of social care will be included.

Analysis consists of regression models using likelihood of emergency admissions as the dependent variable, with explanatory variables such as presence of multimorbidity, deprivation, use of social care and basic demographic variables. We will also examine likelihood of multimorbidity and likelihood of use of social care with inequality as an explanatory variable.

# Using routine administrative healthcare records to comprehensively assess the non-fatal and fatal burden of 132 conditions in Scotland

Grant Wyper<sup>1</sup>, Ian Grant<sup>1</sup>, Oscar Mesalles-Naranjo<sup>1</sup>, Elaine Tod<sup>2</sup>, Catherine Bromley<sup>2</sup>, Richard Dobbie<sup>1</sup>, Neil Craig<sup>2</sup>, Colin Fischbacher<sup>1</sup>, Gerry McCartney<sup>2</sup>, Diane Stockton<sup>2</sup>

<sup>1</sup>Public Health and Intelligence; <sup>2</sup>Health Scotland

# Introduction

Detailed estimates on the burden of disease allows us to see how the full spectrum of disease and injury is contributing to the overall health loss of a population, thus making comparisons across all diseases and injuries a possibility. In a diverse population such as Scotland, a comprehensive burden of disease study can help policy makers and planners understand variations in local areas, demographic and socioeconomic circumstance, which in-turn provides evidence for the stratified management of healthcare resources and interventions.

# Approach

Previous efforts to quantify the burden of disease in the Scotland have relied on modelled data from other countries. This study was designed to take advantage of the extensive range of structured electronic health records in Scotland to provide a transparent and systematic approach to describing the population health loss due to 132 conditions.

Records on each death in Scotland were used alongside life expectancy data to calculate the Years of Life Lost to premature mortality (YLL) as a measure of fatal burden. To quantify the non-fatal burden, we utilised data across a wide range of healthcare services such as consultations with GPs, community prescriptions and hospital attendances in the inpatient, psychiatric, outpatient and unscheduled care settings. The record linkage of datasets through a common patient identifier allowed for a more thorough search of clinical contacts to provide more accurate estimates. A range of coding systems were utilised to define each condition (READ, ICD, BNF, OPCS). Combining these estimates with the Global Burden of Disease 2015 study's relative assessment of disability for each condition, we were able to calculate the Years Lived with Disability (YLD). Combining YLL and YLD provides an estimate of the number of Disability-Adjusted Life Years (DALY), which encapsulates the full burden of non-fatal and fatal disease.

# Evolution in mortality from screenable cancers in migrant women between the 1990s and 2000s in Belgium

Wanda Monika Van Hemelrijck<sup>1</sup>, Helga AG de Valk<sup>2</sup>, Hadewijch Vandenheede<sup>1</sup>

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Trends in cancer outcomes by migrant status differ by gender, immigrant country, and migrant background group. However, evidence is scarce and usually gives a broad overview of trends only. Regional screening programmes for breast and cervical cancer targeted at women aged 50-69 and 25-69, respectively, have been implemented in the 2000s in Belgium. A view on how mortality from these cancers has changed by migrant background for each region between the 1990s and 2000s could point to useful information for public health planning.

We aim to examine how cancer mortality from breast and cervical cancer in women evolved by region between the 1990s and 2000s and whether these evolutions are different by migrant group in Belgium.

We use two censuses linked with 6-year mortality and emigration follow-up information from registry data (1991-1997; 2001-2007). Cervical cancer mortality for women aged 25-69 and breast cancer mortality for women aged 50-69 in the 1990s in each region (Flanders, Brussels and Wallonia) is compared to that in the 2000s. Indirectly standardised mortality rates (ISMR) and rate ratios (RR) are calculated for each period by region and migrant group, and are compared using rate differences (RD).

Breast cancer mortality increases for practically all groups throughout Belgium, but observed increases are not always statistically significant. Mortality from cervical cancer rises for Belgians in the three regions, and South-Europeans in Wallonia. Differences in breast cancer mortality between Belgians and South Europeans decrease between the 1990s and 2000s (0,43 [0,28-0,67] to 0,98 [0,78-1,22]), and between Belgians and Western Europeans/other Western migrants (0,79 [0,68-0,92] to 1,08 [0,97-1,19]) in Flanders. Differences in cervical cancer mortality levels do not change significantly between the 1990s and 2000s.

The omnipresent increase in breast cancer mortality is a reason for public health concern and should be examined more closely.

# Minimal inference from incomplete 2x2 tables

Li-Chun Zhang<sup>1</sup>, Raymond L. Chambers<sup>2</sup>

<sup>1</sup>University of Southampton, <sup>2</sup>University of Wollongong

Estimates based on 2x2 tables of frequencies are widely used in statistical applications. However, in many cases these tables are incomplete. Minimal inference addresses those situations where this incompleteness leads to target parameters for these tables that are interval, rather than point, identifiable. In particular, we develop the concept of corroboration as a measure of the statistical evidence in the observed data that is not based on comparing likelihoods. The corroboration function then identifies the parameter values that are the hardest to refute, i.e., those values which, under repeated sampling, remain in the identification interval. This enables us to develop a general approach to inference from incomplete 2x2 tables when the additional assumptions required to support a likelihood-based approach cannot be sustained based on the data available. This minimal inference approach provides a common ground for all further analysis that aims at making sharper inference supported by plausible external beliefs. We illustrate our approach by applying it to two real datasets.

# ACE programme East Midlands evaluation. What impact has the introduction of a straight to test pathway had on early diagnosis in oesophageal and gastric cancer?

James Catton<sup>1</sup>, Paul Leeder<sup>2</sup>, Lesley Brewer<sup>3</sup>, James Jones<sup>4</sup>

<sup>1</sup>Nottingham University Hospitals; <sup>2</sup>Derby Hospitals Foundation Trust; <sup>3</sup>East Midlands Clinical Network; <sup>4</sup>East Midlands Academic Health Science Network

# Background

As part of the ACE programme supported by NHS England, Cancer Research UK and Macmillan Cancer Support, six hospital Trusts across the East Midlands introduced a straight to test (STT) pathway, whereby GPs can refer symptomatic patients with suspected upper gastroenterology (uGI) cancer straight to their appropriate diagnostic test via a triage service. The STT pathway was designed to bypass the initial outpatient appointment and ideally to decrease the time to reaching a confirmed diagnosis, with the intention of improving overall patient experience and outcomes.

# Method

Anonymized patient level data from each Hospital Trust in the region was collected from their patient administration cancer tracking systems (Infoflex or Somerset Cancer Register) for all patients referred between 2013 and 2015 with suspected uGI cancer that were diagnosed with cancer. This data was then stratified by patients who were referred STT and those who were referred on a traditional pathway (who were seen in an outpatients setting first). The two cohorts were then compared against each other measuring how long patients waited in days between key milestones on the patient pathway. Data from two Trusts who did not implement the STT pathway were used as a benchmark control.

# Findings

- STT has no significant effect on time between referral and when the patient is first seen.
- STT saves on average 16 days from referral to diagnosis.
- STT patients wait on average 7 days longer from diagnosis to their treatment.
- Overall, from referral to treatment, STT saves on average seven days.

# Conclusion

STT has had a positive impact on referral to treatment times. Most benefit was seen in the referral to diagnosis period, and the time taken to treatment from diagnosis was longer, but overall there was an average of 7 days saved using a STT system.
### Poster Abstract Number - 21

### Disparity in health care utilization for participants of General Household/Lifestyle Survey reporting physical versus mental health problems

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Prior research has investigated the equality of health care use across the population. Only rarely have these studies focussed on the relationship between variations in health care use and morbidity. This study has capitalized on the information included in the General Household/Lifestyle Survey (1973 to 2012) to determine the disparity of health care utilization in England.

We explored the changes in health care experienced by people with no self-reported health problems, mental health problems, and/or physical health problems and identified the difference in health care utilization for these sub-populations.

During the period covered by the General Household/Lifestyle Survey, England experienced 4 financial crises (1973-76, 1980-81, 1991-2, and 2008). Financial crises increase demand for UK mental health care, and put the supply of care for the mentally ill at risk. This is the first population based study to evaluate the fluctuation of health care utilization for these sub-populations in times of economic stability and instability.

At the conference we will present the health care utilization of people with no selfreported health problems, mental health

# The Royal College of Surgeons

The Royal College of Surgeons of Edinburgh is one of the oldest surgical corporations in the world having been given the Seal of Cause in 1505. The award-winning Museums are home to one of the largest and most historic pathology collections in the United Kingdom. Surgeons' Hall Museums reopened in 2015 after a major Heritage Lottery Funded redevelopment project. As one of the oldest Museums in Scotland, the collections grew from 1699 after 'natural and artificial curiosities' were publically sought, The iconic Playfair Building opening in 1832 to house the Barclay and Bell collections.

ADRN2017 takes place across 3 buildings in this historic venue, but who are the rooms named after?

### Wolfson Hall – ADRN2017 Plenary Space

Sir Isaac Wolfson, 1st Baronet, Fellow of the Royal Society (17 September 1897 – 20 June 1991) was a



businessman and philanthropist. He was managing director of Great Universal Stores (G.U.S.), from 1932 to 1947 and chairman between 1947 and 1987. G.U.S. originally a mail order company, was split in 2006 into Experian and the Home Retail Group (now owned by Sainsbury's). Sir Isaac established the Wolfson Foundation to distribute most of his fortune to good causes.

The Wolfson Foundation is a charity that awards grants (~£32 million annually) to support excellence in the fields of science and medicine, health, education and the arts and humanities. Part of the grant in 2012 went to Royal College of Surgeons of Edinburgh to refurbish the museum.

## G B Ong Room

Professor GB Ong (20 September 1921 - 10 January 2004) graduated from the University of Hong Kong

in 1947. After serving fellow-ships of the Royal College of Surgeons of Edinburgh and England, Ong became the first ethnic Chinese to head the Department of Surgery at the University of Hong Kong in 1963.

G.B had a famous fiery temper and impatience with those around him. This was coupled with a tireless devotion to achieve the best for patients, beginning his day at 5a.m. with a 2 mile jog before going to work, he once remarked that 12 hours of work is 'a luxury' for a surgeon. He established an animal laboratory and many of his protegees made significant contributions to different aspects of surgery under his direction.



Some of his many honours include the first John Bruce Gold Medal from the Royal College of Surgeons of Edinburgh, the Majid Ismail Gold Medal, the Abraham Colles Model, the Medal of the Royal Australasian College of Surgeons, not to mention an O.B.E from the Queen and 'Tan Sri' by the Majesty the King of Malaysia.

## **Tausend Room**

Captain Milton E. Tausend (15 July 1907- May 1987) graduated from the University of North Carolina in



**ausend** (15 July 1907- May 1987) graduated from the University of North Carolina in 1930 before studying at the Royal College of Surgeons in Edinburgh. He became a Licentiate of all three Scottish Colleges in October 1934 (via what was known as the Triple Qualification Scheme). He was appointed a Captain of the Medical Corps in the US army and penned the poems on the following page. After the war, Milton practised radiology in New York City for many years and became a member of the Royal Society of Health in 1970. He married Ruth, daughter of German physician and war hero Joseph Herman Isenstead.

Dr Tausend retained a particular love for The Royal College of Surgeons of Edinburgh and bequeathed a substantial legacy to the College.

### TANK MEN

Out of their tombs they crawl Weird, misshapen men. Faces tattooed with cordite, Eyes sullen and red. Nine house in the tanks Have made them kin to the dead.

- Capt. Milton E. Tausend

### WOUNDED

...it feels so unreal falling here
without pain ... without fear ...
unable to move ... alone on the
ground...
furiously the battle rages overhead
warning the sky with tracer thread!

- Capt. Milton E. Tausend

### Wadsworth Room

Thomas Wadsworth (13 January 1930 - 8 February 2002) was one of the most colourful orthopaedic



surgeons of his generation. Initially studying dentistry at Liverpool University, he soon followed his older brother into medicine and became a prolific writer on elbow and hand surgery. After travelling to work in Michigan, he returned to England in 1972 to be appointed orthopaedic surgeon at St Leonard's Hospital in London, where he introduced Swanson's implant - a prosthetic finger joint - into British surgical practice.

Thomas also developed various prosthetic devices, including a device which helps to stabilise the elbow joint after it has been broken. His method of gaining access to the elbow joint from behind is still known as the Wadsworth procedure.

He carried out important studies into cubital tunnel syndrome, an inherited condition related to the angle of the elbow, which results in loss of power in the fingers. He developed a test, known as the Wadsworth Elbow Flexion Test, which is commonly used to diagnose this syndrome.

His experience and oratory skills meant that Thomas was frequently used as an expert opinion. He made a number of television appearances contributing to a variety of topics, from ankle injuries in footballers to the orthopaedic problems of the Royal Family and the dangers of wearing stiletto heels. At the time of his death he was preparing the second edition of his textbook – *The elbow*, together with a companion surgical atlas.

### Playfair Hall

William Henry Playfair (15 July 1790 - 19 March 1857) was one of the greatest Scottish architects of the

19th century, designer of many of Edinburgh's neo-classical landmarks, shaping the modern city. Some of his finest works are the neo-classical buildings of the National Gallery of Scotland, the Royal Scottish Academy, both in the centre of Edinburgh.

As Edinburgh's reputation in teaching medicine grew throughout the 1700s, so the Royal College of Surgeons of Edinburgh needed larger premises to teach students and to house their specimens and anatomicalexamples. In 1822 William was appointed and the site on Nicholson Street was chosen as offering ample space for the new hall, opening on 7 July 1832. On his death, Playfair's trustees presented 5,062 of his drawings to the University of Edinburgh, where



they are held in the University Library. The Playfair Hall formally reopened 28 September 2015 after an 18-month redevelopment.

# **REGISTERED DELEGATES**

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Cerard         Genevieve         genevieve.cezard@ed.ac.uk         University of Edinburgh           Chatsiou         Kakia         achats@essex.ac.uk         University of Edinburgh           Chi         Ethan         y.chi@qub.ac.uk         Queen's University of Edinburgh           Chi         Ethan         y.chi@qub.ac.uk         Queen's University of Edinburgh           Choi         Hyunsoo         ppiji@naver.com         Affairs           Choi         Hyunsoo         Schotvijit@warwick.ac.uk         The University of Warwick           Clark         David         david.clark@rscotland.gov.uk         National Records of Scotland           Clark         Ross         Ross.Clark@gasgow.ac.uk         University of Edinburgh           Clarke         Auren         auren.clarke@nrscotland.gov.uk         NRS           Clelland         David         david.clelland@glagsgow.ac.uk         University of Edinburgh           Cook         Alex         Public Panel         Cooper           Cooper         Janine         j.cooper@ulster.ac.uk         University of Suthampton           Cox         Fiona         fmb@st-andrews.ac.uk         University of Suthampton           Cox         Fiona         fmb@st-andrews.ac.uk         University of Southampton           Curage	Campbell	Archie	archie.campbell@igmm.ed.ac.uk	Generation Scotland					
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#### Across

- 1 Where ADRN2018 will be held 7
- 5 A key speaker at ADRN2017 5
- 9 The systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions 8
- 10 A group or system of interconnected people or things 7
- 12 The \_\_\_\_\_ Act 2017 new legislation on data privacy across the EU – 77
- 13 Better Knowledge Better \_\_\_\_\_ the slogan of the ADRN 7
- 15 Fixed or fastened so as not to give way, become loose, or be lost. OR free from, or not exposed to danger or harm 6

Down

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11

- 2 Relating to the running of an organization 14
- 3 The \_\_\_\_\_ Hall, plenary space for ADRN2017 7
- 4 Peter \_\_\_\_\_ the ADRN director 5
  - Facts and statistics collected together for reference or analysis 4
  - One of the five safes of research within the ADRN 8
  - The centre at UCL that provides support for the ONS Longitudinal Study, covering England and Wales - 7 The action of joining data (or anything) together - 7
- 14 \_\_\_\_\_ and Longitudinal Studies Hub (CALLS-Hub) a key partner in ADRN2017 6

evaluation	administrative
knowledge	data
better	linkage
society	social
research	science
adrn	policy
public	value
benefit	methods
migration	inequality

Find the words above in the grid. Words can be forwards, backwards, horizontal, vertical or diagonal. Find the message in the letters left over after you have found all the words in the grid.

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t	0	h	а	s	e	h	i	t	а	s	g	а	v	d	r	n
t	v	а	ι	u	e	t	w	n	e	у	с	i	ι	0	р	n
t	у	s	n	e	v	e	t	n	k	t	t	i	е	b	е	s
е	n	w	0	0	r	р	d	е	s	а	е	а	е	e	r	0
v	с	h	i	с	0	u	d	е	r	b	g	е	t	n	t	с
а	d	а	t	а	e	b	r	t	k	n	0	e	w	e	с	i
u	ι	е	а	s	d	ι	s	g	e	b	е	t	m	f	t	е
ι	е	r	r	0	s	i	0	а	d	r	n	с	е	i	i	t
а	е	t	g	с	n	с	у	b	у	t	w	e	t	t	ι	у
t	f	t	i	i	h	j	u	n	e	f	0	r	h	t	h	е
i	с	h	m	а	а	n	с	е	0	f	а	s	0	р	e	с
0	с	d	i	ι	а	ι	k	n	0	w	ι	e	d	g	e	р
n	а	r	i	t	z	e	х	h	с	r	а	e	s	e	r	r

## Notepaper

## Notepaper

## Notepaper



### Some ADRN Upcoming Events

Training - Combining Data from Multiple
 Administrative and Survey Sources for Statistical
 Purposes
 University of Southampton
 08 - 09 Jun, 2017

Training – Safe User of Researcher Data Environments Edinburgh Bioquarter, Edinburgh 13 Jun 2017

Training - SQL Database Management Software The Farr Institute, University College of London 28 Jun, 2017

Training – Introduction to QGSI: Understanding
 & Presenting Spatial Data
 University College London
 19 Jul 2017

Training – Introduction to Spatial Data & Using R as a GIS University College London 20 Jul 2017

Training – Confident Spatial Analysis University College London 21 Jul 2017

Event - IADS - Big Data and Analytics Summer School University of Essex 24 Jul - 04 Aug, 2017

## Training - Combining Data from Multiple Administrative and Survey Sources for Statistical Purposes

Swansea University Medical School 07 - 08 Nov, 2017

Training – Working with Administrative Data Edinburgh Training and Conference Venue, Edinburgh 27 Nov - 1 Dec, 2017

Event – The Administrative Data Research
 Conference
 Belfast
 20 – 22 Jun 2018

NEW CALLS-HUB Full Data Dictionary with save project list function NOW AVAILABLE!

Visit the CALLS Hub website at <u>calls.ac.uk</u> for a range of information including:

- Information about the LSs and the Research Support Units
- Thematic guides and webinars providing an introduction to using the data for specific topics
- A data dictionary allowing you to explore the variables held in the LSs and create your own custom lists of variables for applications
- A searchable database of outputs
- News and events
- Research briefs
- And more...







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# JOIN US IN BELFAST NEXT YEAR FOR ADRN2018