Doha, Qatar
The International School
on Research Impact Assessment
"Learning to assess research with the aim to optimise returns"

ANALYSIS
HOW DO YOU ANALYZE 6,679 CASE STUDIES?

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THE POLICY INSTITUTE, KING'S COLLEGE LONDON

NOVEMBER 9- 2015

الصندوق القطري لرعاية البحث العلمي
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The nature, scale and beneficiaries of research impact

An initial analysis of Research Excellence Framework (REF) 2014 impact case studies

King's College London and Digital Science

Prepared for the Higher Education Funding Council of England, Higher Education Funding Council for Wales, Scottish Funding Council, Department of Employment and Learning Northern Ireland, Research Councils UK and the Wellcome Trust

March 2015

DIGITAL science

KING'S College LONDON
Digital Humanities

The Policy Institute at King's

Our sources of data

	Panel A (Life sciences)	Panel B (Engineering and Physical sciences)	Panel C (Social sciences)	Panel D (Arts & humanities)	Total
Total number of submitted case studies	1,621	1,667	2,040	1,647	6,975
Number of redacted case studies (% of total number of submitted case studies by panel)	27 2%	182 11%	67 3%	20 1%	296 4%
Total number of case studies analysed (as % of all analysed case studies)	**1,594** **24%**	**1,485** **22%**	**1,973** **30%**	**1,627** **24%**	**6,679**
Number of partially redacted case studies (% of total number of submitted case studies by panel)	87 5%	209 13%	75 4%	57 3%	428 6%

Panel A

UOA 1	Clinical medicine
UOA 2	Public health, health services and primary care
UOA 3	Allied health professions, dentistry, nursing, pharmacy
UOA 4	Psychology, psychiatry, neuroscience
UOA 5	Biological sciences
UOA 6	Agriculture, veterinary and food science

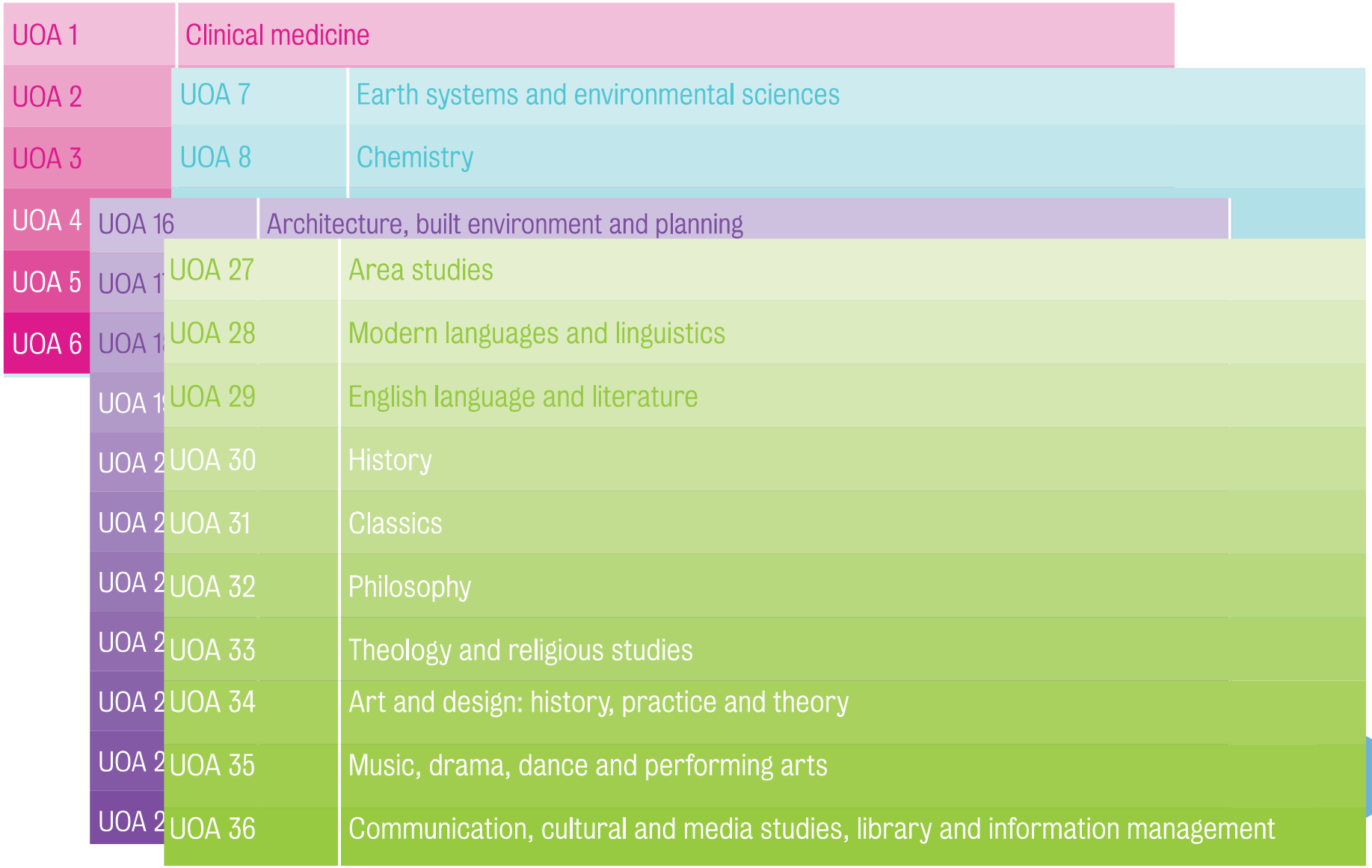
Panel B

UOA 1	Clinical medicine	
UOA 2	UOA 7	Earth systems and environmental sciences
UOA 3	UOA 8	Chemistry
UOA 4	UOA 9	Physics
UOA 5	UOA 10	Mathematical sciences
UOA 6	UOA 11	Computer science and informatics
	UOA 12	Aeronautical, mechanical, chemical and manufacturing engineering
	UOA 13	Electrical and electronic engineering, metallurgy and materials
	UOA 14	Civil and construction engineering
	UOA 15	General engineering

Panel C

UOA 1		Clinical medicine
UOA 2	UOA 7	Earth systems and environmental sciences
UOA 3	UOA 8	Chemistry
UOA 4	UOA 16	Architecture, built environment and planning
UOA 5	UOA 17	Geography, environmental studies and archeology
UOA 6	UOA 18	Economics and econometrics
	UOA 19	Business and management studies
	UOA 20	Law
	UOA 21	Politics and international studies
	UOA 22	Social work and social policy
	UOA 23	Sociology
	UOA 24	Anthropology and development studies
	UOA 25	Education
	UOA 26	Sport and exercise sciences, leisure and tourism

Panel D


UOA 1
Clinical medicine
UOA 2
UOA 7
Earth systems and environmental sciences
UOA 3
UOA 8
Chemistry
UOA 4
UOA 16
Architecture, built environment and planning
UOA 5
UOA 27
Area studies
UOA 6
UOA 28
Modern languages and linguistics
UOA 29
English language and literature
UOA 30
History
UOA 31
Classics
UOA 32
Philosophy
UOA 33
Theology and religious studies
UOA 34
Art and design: history, practice and theory
UOA 35
Music, drama, dance and performing arts
UOA 36
Communication, cultural and media studies, library and information management

Impact Case Studies Written up in 4-page Template

Title of case study:

1. Summary of the impact (indicative maximum 100 words)

2. Underpinning research (indicative maximum 500 words)

3. References to the research (indicative maximum of six references)

4. Details of the impact (indicative maximum 750 words)

5. Sources to corroborate the impact (indicative maximum of 10 references)

Impact Case Studies Written up in 4-page Template

Title of case study:

1. Summary of the i

2. Underpinning res

3. References to the
references)

REF2014
Research Excellence Framework

4. Details of the impact (indicative maxium 750 words)

4. Details of the impact (indicative maximum 750 words)

5. Sources to corroborate the impact (indicative maximum of 10 references)


work
public
policy
development
uk
project
national
international
government
university
including
health
evidence
report
programme
world
used
people
group
patients
practice
source
support
findings
industry
community
design
understanding
education
history
children
services
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based
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south
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power
members
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general

Analysis methods

Topic modelling:
Identify hidden thematic structur or topics in corpus of documents

Keyword in context:
Identify keywords displayed within surrounding context

Information extraction:
Automate extraction of specific words (nouns) such as countries

Qualitative analysis:
Read and hand-code samples of case studies

TEXT MINING & TOPIC MODELLING 1.01

The demonstration by Warwick researchers that reduced dietary salt intake lowers BP in a dose - dependent manner (1) and in different geographic settings (3-4) across individuals with various baseline levels of BP (1) gave impetus to national and global health policy developments. Crucially, the prospective association of reduced salt intake with a lower risk of fatal and non-fatal CVD events underpinned the development of national salt reduction programmes in the UK (2008 - 2012) (a) and internationally (2010-2013) (b-e).

National and international recommendations on dietary salt intake. Dietary salt intake is high in almost all populations, and its reduction would lead to a reduction in strokes and heart attacks (2). Through the WHO Collaborating Centre at Warwick and Cappuccio's participation in various committees (Population Reduction in Salt Intake, WHO, Geneva [2006]; European Salt Initiative, WHO, Copenhagen [2006]; European Salt Action Network [2007; founding member and lead of a subgroup], Public Health Program Development Group for NICE Guidance on Prevention of Cardiovascular Disease [2008-2010] and Expert Testimony; Cardiovascular Disease Prevention through Dietary Salt Reduction, PAHO/WHO, Washington DC [2009 -2012; subgroup lead]; and Advisory Group on Nutrition, WHO Geneva [2012-2016]), we have influenced the adoption of policies leading to reduced salt intake and have written protocols, guidelines and recommendations on how to encourage lower salt intakes (a; b; d; g; j-l).

Policies to control salt intake are now recommended by the WHO and most governments, and have been endorsed at the United Nations High Level Meeting on the Prevention of Non- Communicable Disease (2011). In 2007, WHO re-stated recommendations of salt targets of 5g per day. Since then, it has developed policies in every continent for the implementation of population salt reduction programmes under the WHO Action Plan on Obesity, Diet and Physical Activity [b]. The WHO 65th World Health Assembly (2012) decided that population dietary salt should be reduced and should be a priority alongside tobacco control for the reduction of non - communicable disease worldwide. Examples of early adopters of these policies are Slovenia (monitoring and surveillance 2008-13), Argentina, Costa Rica and Chile (monitoring tools 2010-13) and South Africa (regulation 2012) (b; d; e).

Increased public awareness. In addition to scientific dissemination through publications, reviews, editorials and international meeting presentations on the findings of underpinning research, Warwick researchers have contributed to the three-pronged approach of salt reduction programmes: consumer awareness, food reformulation, monitoring and surveillance (Sutherland J *et al.* Br J Nutr 2013;110:552-8 - Brinsden HC *et al.* BMJ Open 2013;3:e002936). Since 2008, the WHO Collaborating Centre at Warwick has held the mandate to work within a global platform to increase research output and operational support to WHO offices (Geneva [Global], Copenhagen [Europe], Washington [PanAmerican], and Cairo [Eastern Mediterranean), and to lead and support monitoring and surveillance in individual countries. We have participated and contributed directly through the WHO Global Platform to all aspects of the three-pronged approach (b; d; e). We have engaged in additional dissemination activities through our website (www2.warwick.ac.uk/go/cappuccio/research_impact) and partnership with non-governmental organizations, such as Consensus Action on Salt and Health (CASH) (h) and the UK Health Forum (i).

Impact on public health and economy. Public health benefits have been achieved through an increased public awareness about the importance of lowering individual salt intake; through industry engagement for the re-formulation of food with lowered salt content; and in the monitoring of salt intake nationally through repeated surveys (Millett C *et al.* PLoS ONE 2012; 7(1): e29836 - Shankar B *et al.* Health Econ 2013; 22:243-50). Crucially, in England and Wales the salt reduction programme has led to reduced salt intake from 9.5g per day in 2001 to 8.1g per day in 2010, a reduction of 1.4 g per day (or 15%). This reduction is estimated to have averted 20,000 CVD events in the UK, of which 8,500 would have been fatal (f) with ~131,000 Quality-Adjusted Life Years (QALY) gained. A gain in QALY indicates an extension of life free from illness. Our contribution is clearly listed in a salt reduction timeline published by CASH (h).

In addition to substantial health gains for the population, reduction of daily salt intake by 3g per day would lead to economic gains, an annual equivalent savings of at least £40M a year in the UK[f]. Globally, a 15% reduction of salt intake over 10 years could avert 6.5M deaths from CVD at a cost ranging between $0.04 and $0.32 per person (g).

Case study 'tagged' to three topics:

- 'Food and nutrition'
  (food product industri nutrit health crop agricultur uk seed)
- 'Clinical guidance'
  (guidelin patient clinic treatment recommend stroke nice risk trial)
- 'International development'
  (develop countri intern world africa polici global govern African)

Information extraction ie locations are 'geotagged'

Keyword search for "QALY"

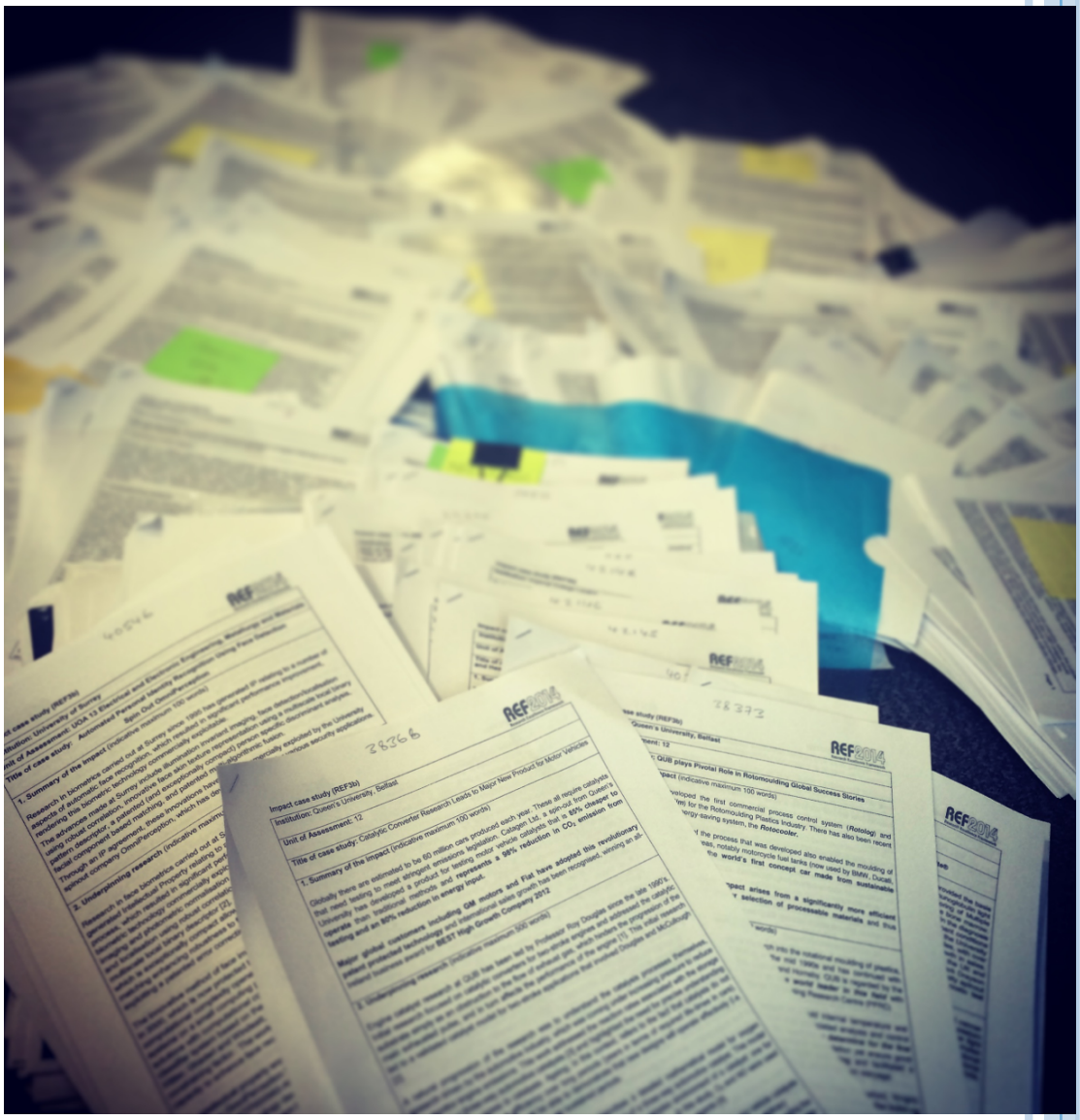
TEXT MINING & TOPIC MODELLING 1.01

Topic label	Words related to this topic
Animal husbandry and welfare	anim welfar farm veterinari breed diseas control uk farmer
Architecture and building	design build construct standard industri structur project architectur engin
Arts and culture	art artist work cultur creativ project public audienc exhibit
Asia	china chines india arab indian asian intern east foreign
Banking, finance and monetary policy	bank financi polici econom financ credit tax risk central
Business and industry	compani busi manag industri product market servic improv sector
Cancer	cancer patient treatment clinic trial uk breast guidelin therapi
Children, young people and families	children child young parent famili imp programm work support
Climate change	climat chang energi carbon emiss uk environment adapt wast
Clinical guidance	guidelin patient clinic treatment recommend stroke nice risk trial
Clinical tests	test patient clinic genet diseas diabet diagnosi diagnost treatment
Community and local government	local commun project citi council social peopl fund develop
Computing and quantum physics	comput secur light ibm physic intel scienc particl imag
Crime and justice	polic crime prison justic xxxx offic violenc offend victim
Cultural and heritage preservation	heritag archaeolog site visitor histor museum project cultur tourism

- 60 impact topics ‘empirically’ derived
- Modelling repeated until patterns/themes/ topics observed
- Topics relate to beneficiary groups or areas of impact
- Mainly used to categorise the case studies and identify topics for further analysis

Qualitative analysis

- Read over 1000 case studies as part of ‘deep mines’ to understand better the scale of impact
- Qualitatively code the case studies around different themes
- Analysis showed the importance of reading case studies to supplement text mining



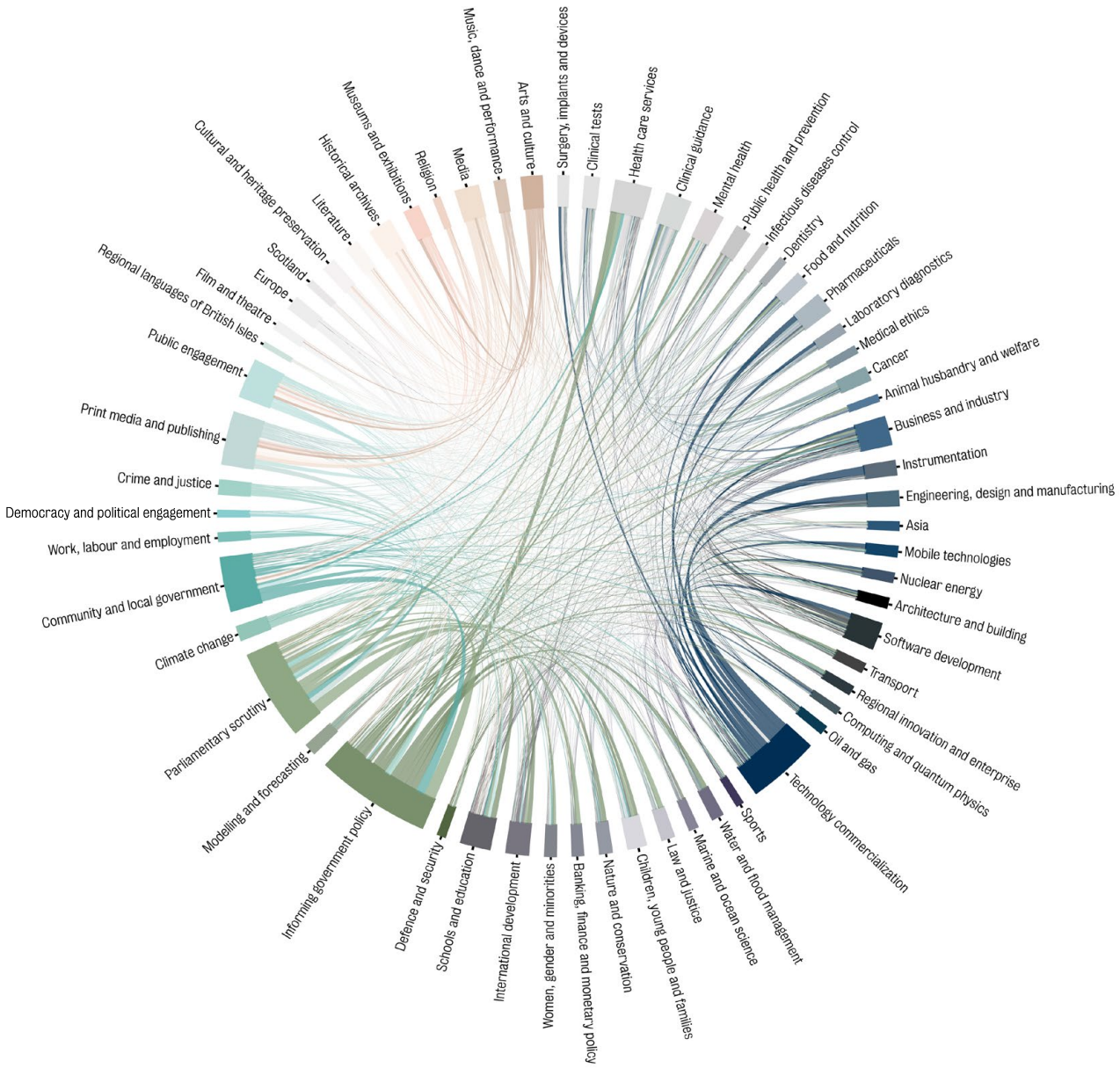
Caveats and limitations to REF analysis

- Limitations of our analysis:
  - Limited time for undertaking the analysis
  - Lack of structure and standardised (meta) data in case studies

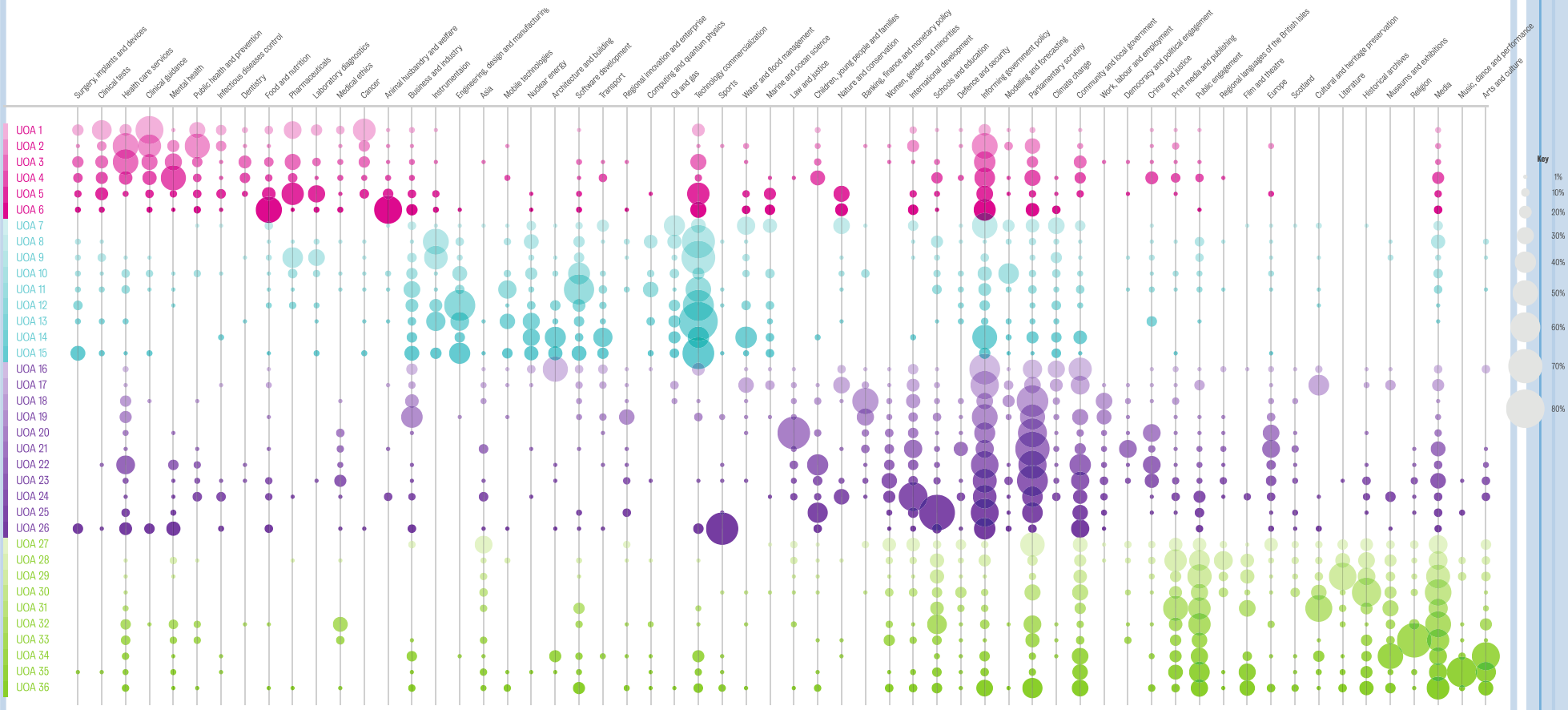
- Limitations of the case studies as research material:
  - The way impact is articulated and described
  - Selective, non representative, set of case studies
  - Double counting of case studies

MACRO ANALYSES

60 IMPACT TOPICS IDENTIFIED



Different types of impact are more common in different disciplines (1)



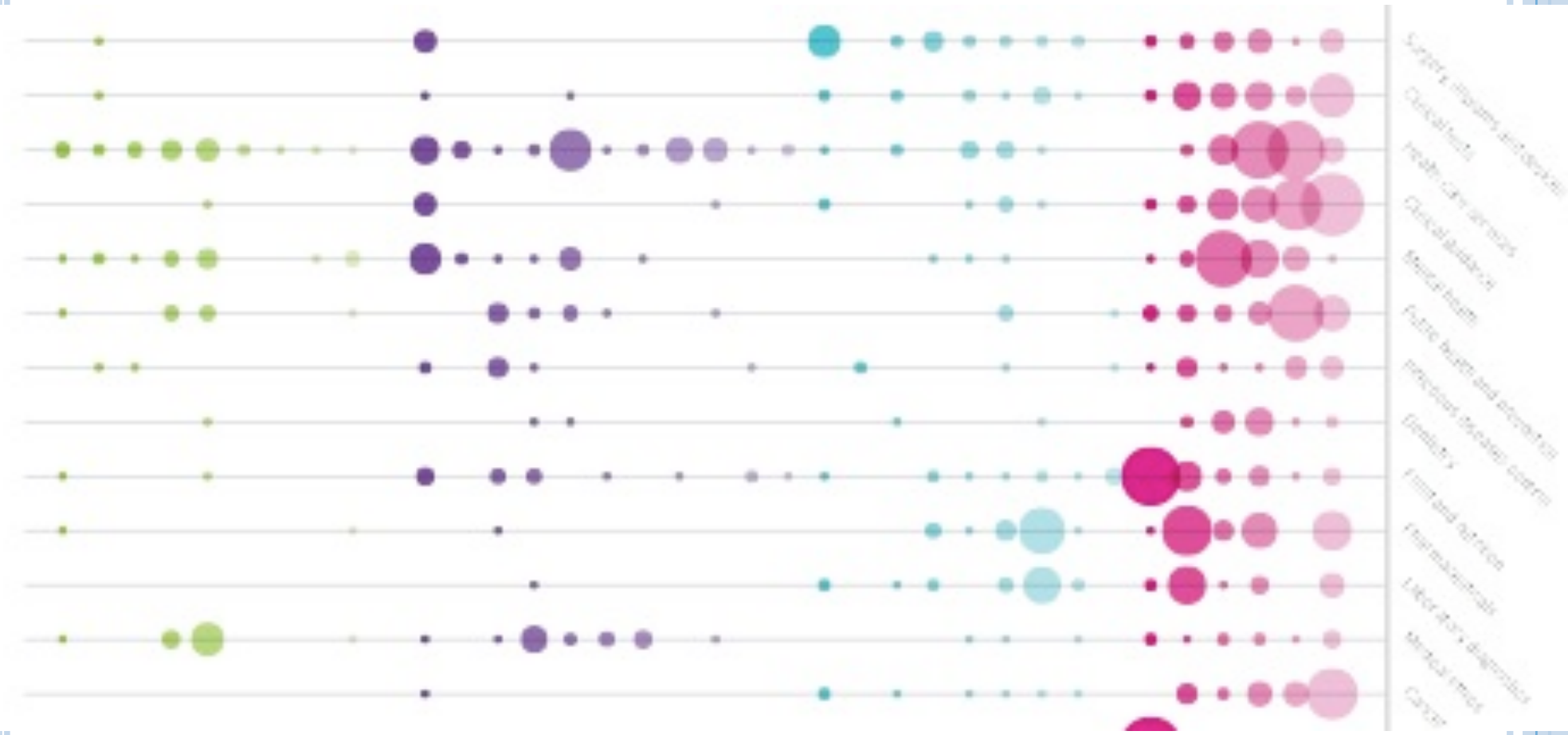
Different types of impact are more common in different disciplines (2)

Panel D
Arts and Humanities

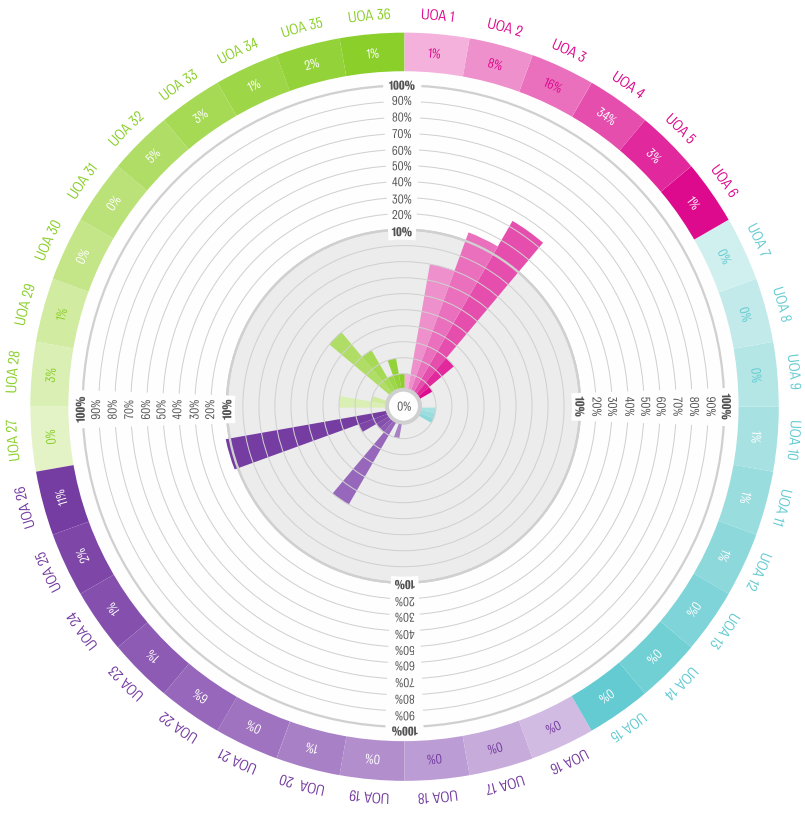
Panel C
Social Sciences

Panel B
Engineering and Physical Sciences

Panel A
Life Sciences



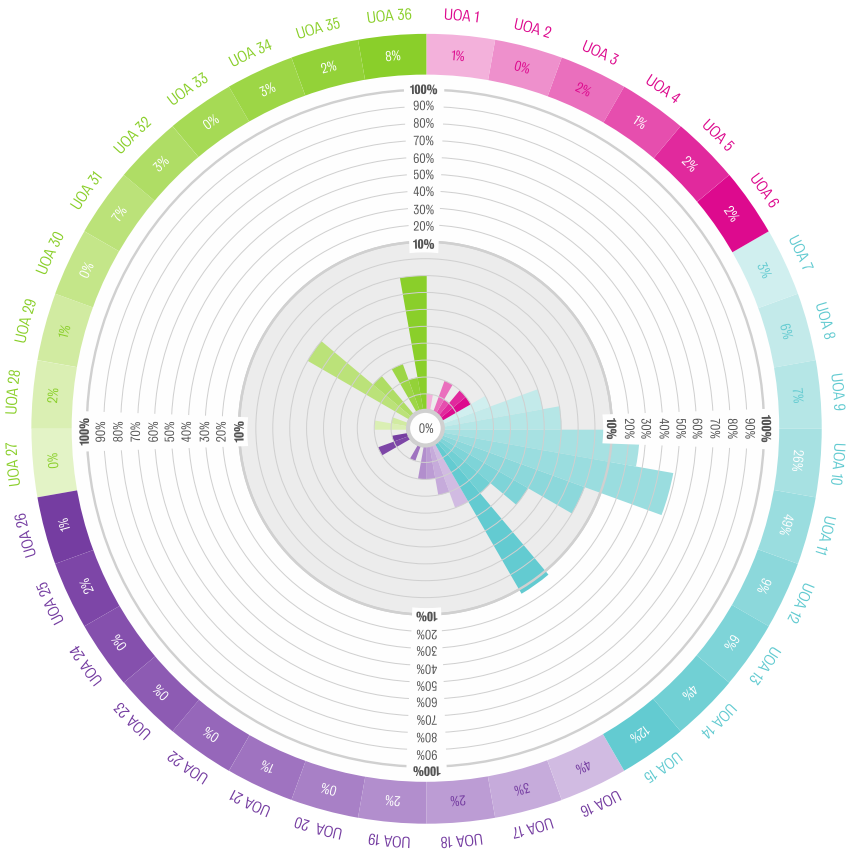
Different types of impact are more common in different disciplines (3)



‘Mental health’

(mental health clinic servic train treatment intervent patient psycholog)

n = 252

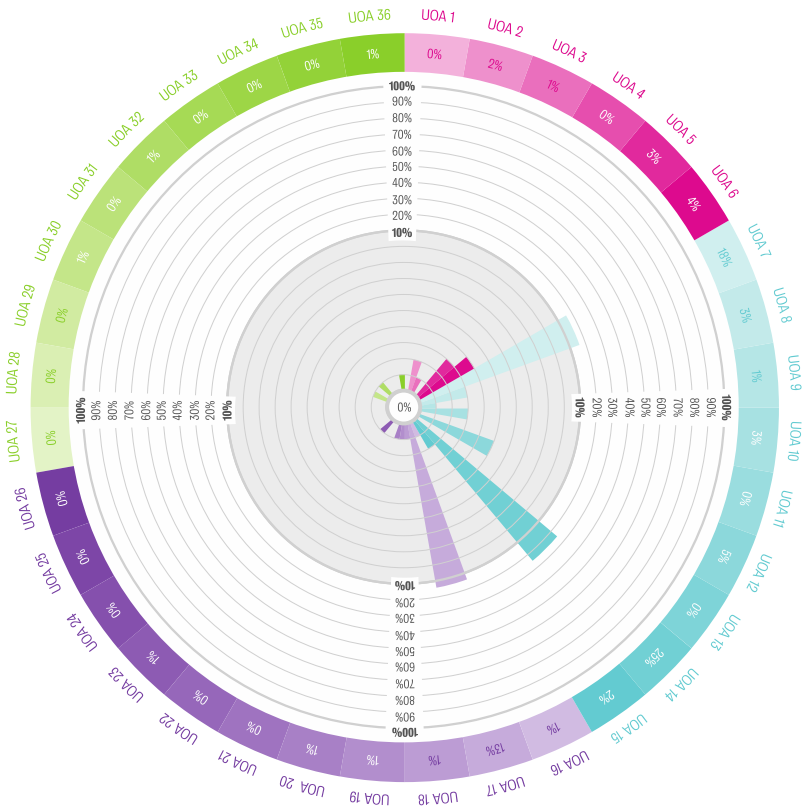


‘Software development’

(softwar develop tool system user data model project comput)

n = 347

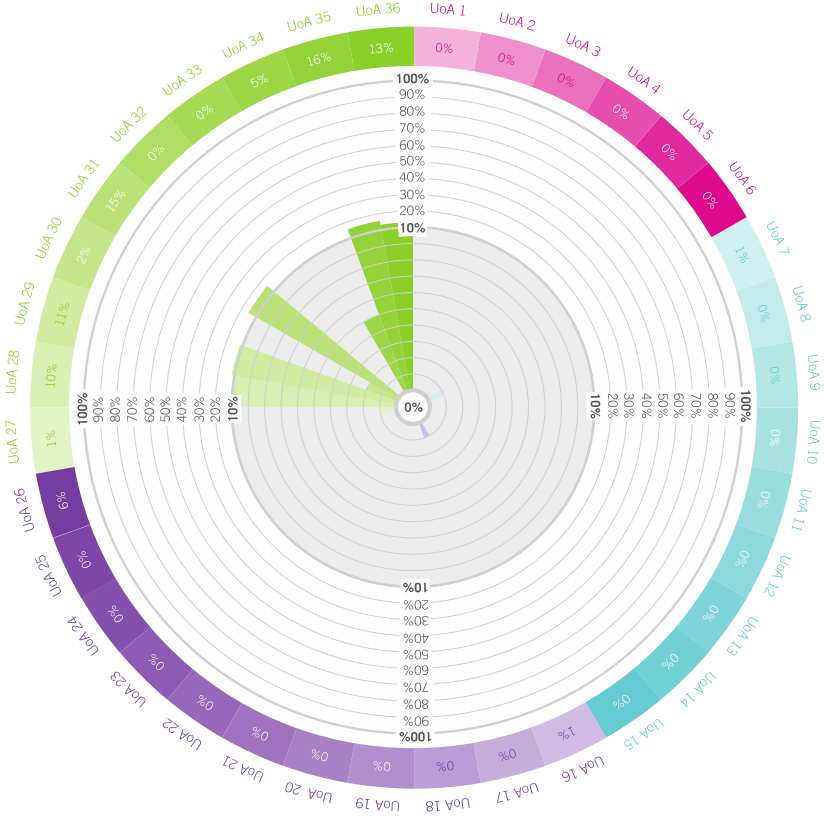
Different types of impact are more common in different disciplines (4)



‘Water and flood management’

(water flood environ risk manag environment uk qualiti pollut)

n = 139

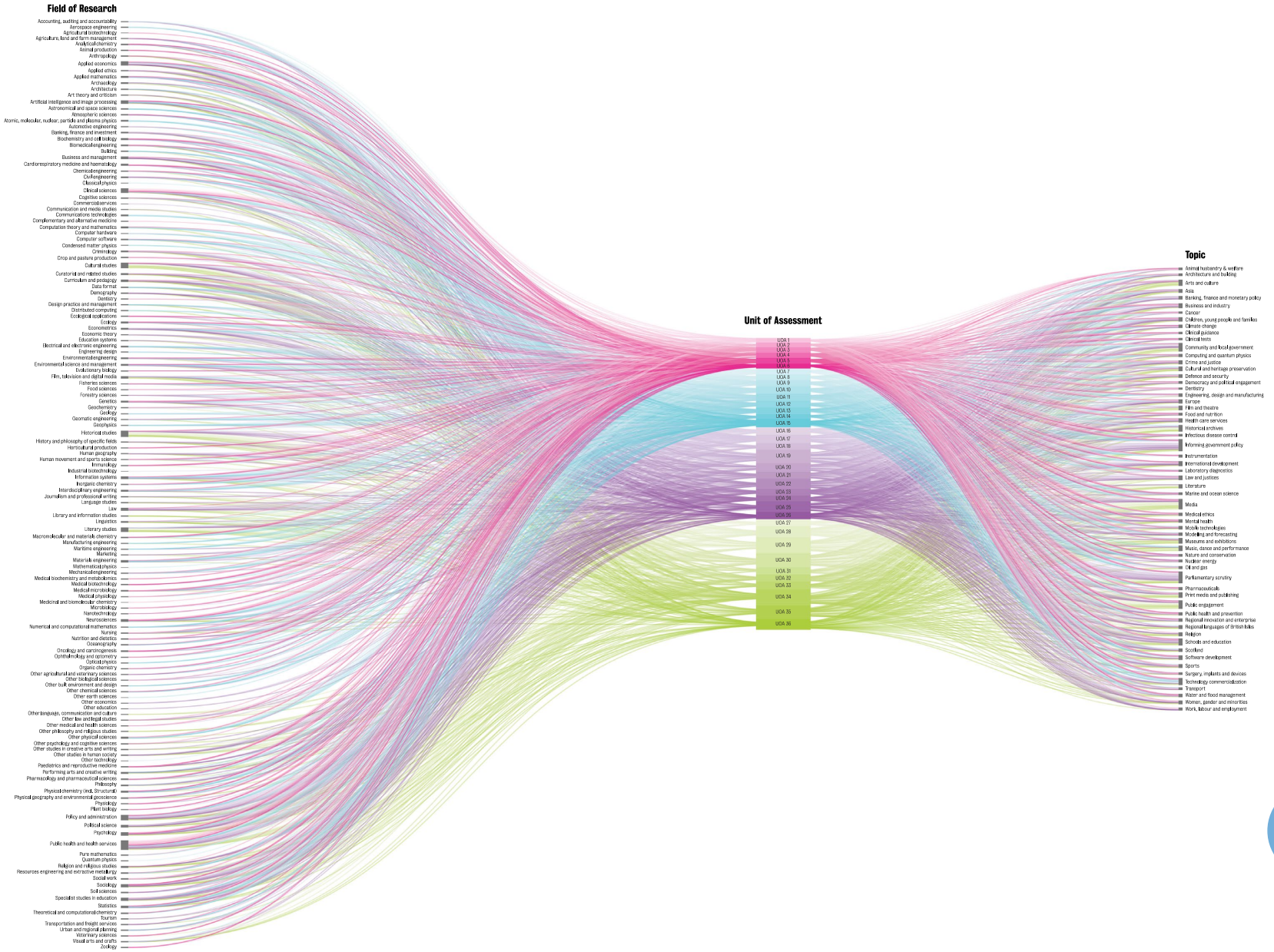


‘Film and theatre’

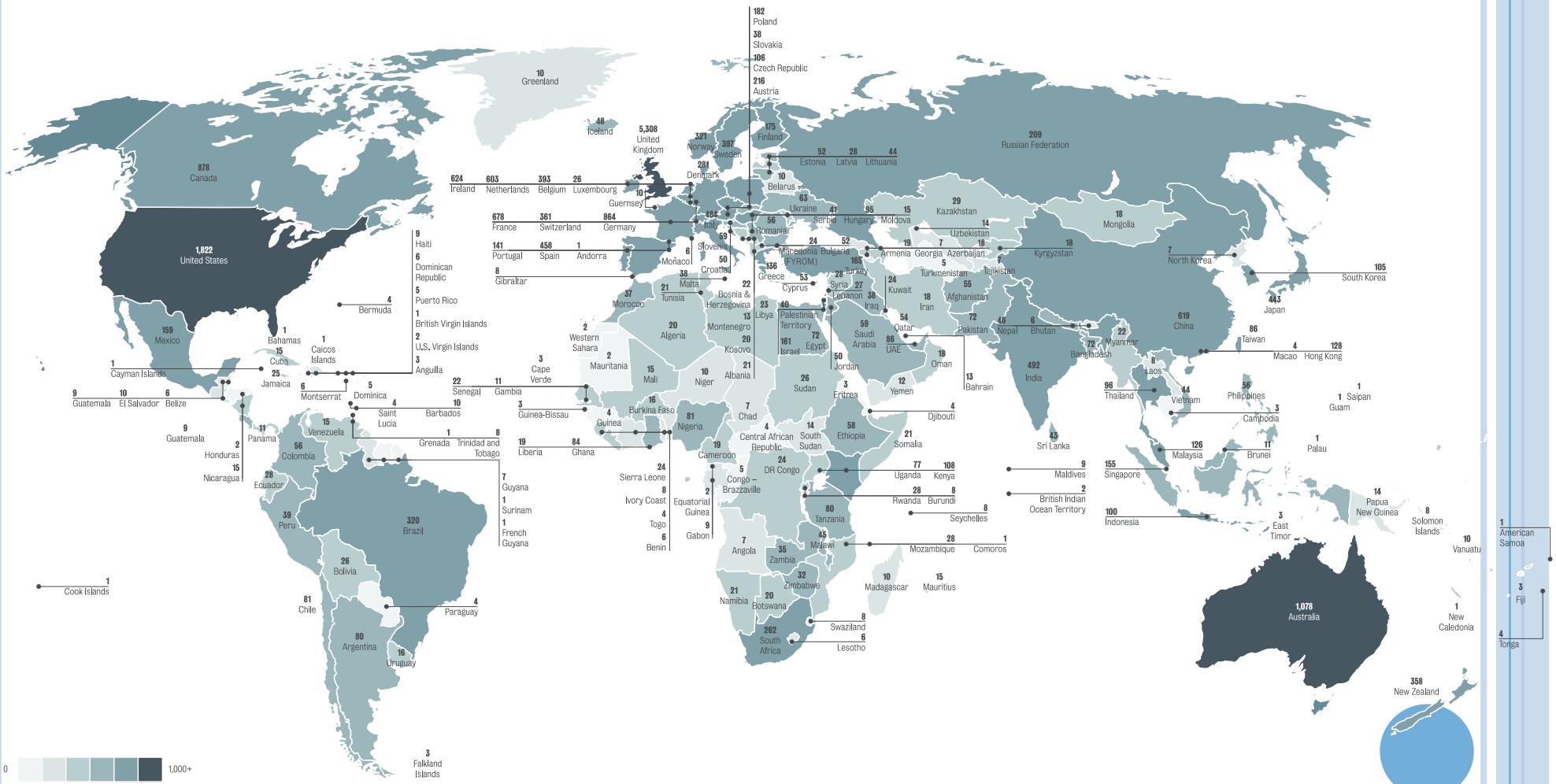
(film theatr perform plai audienc product festiv screen director)

n = 139

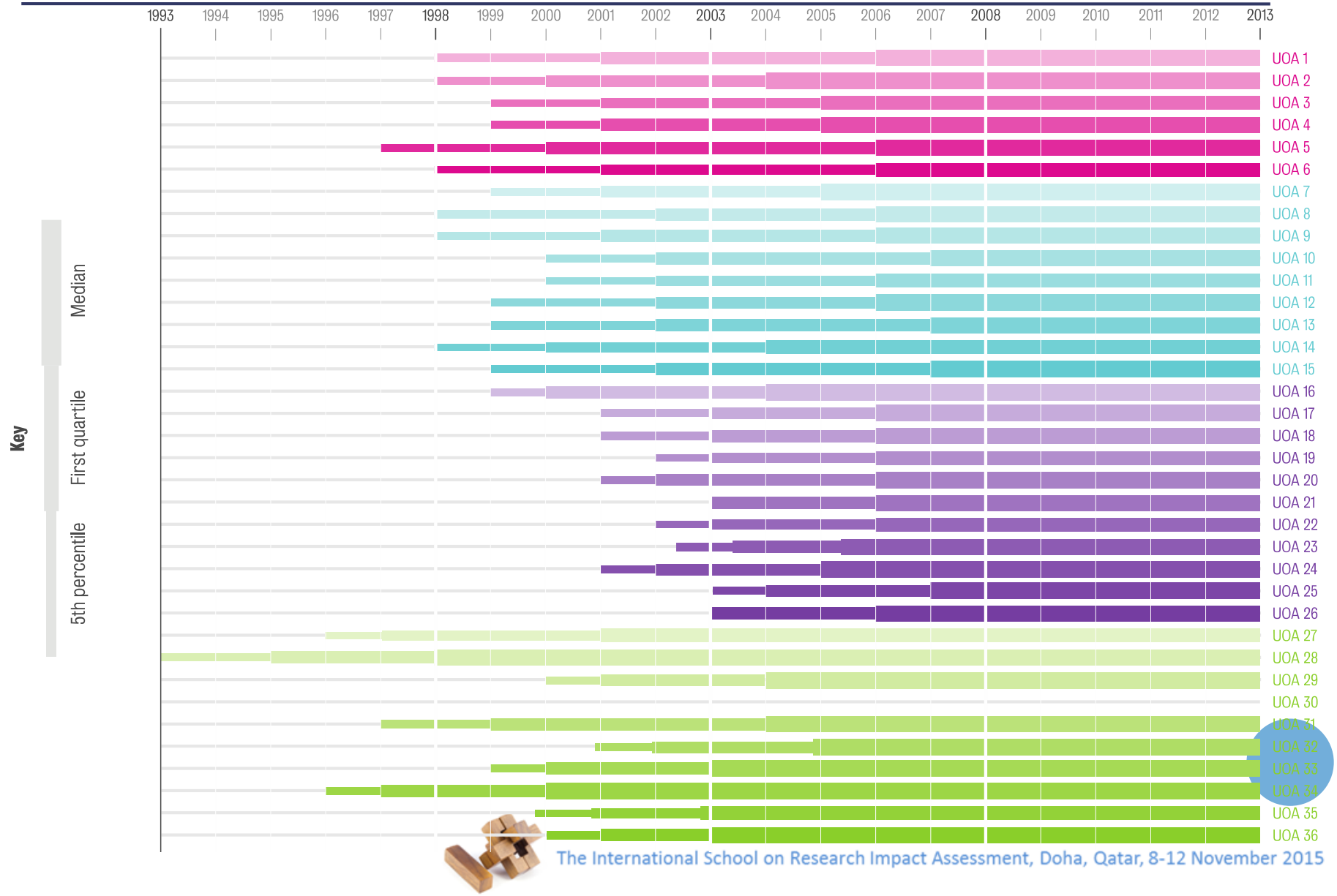
THERE IS A DIVERSE RANGE OF IMPACT PATHWAYS



UK Higher Education Institutes have a global impact



THE TIME IT TAKES TO HAVE AN IMPACT VARIES BY DISCIPLINE



‘DEEP MINES’ ANALYSES

ASSESSING THE SCALE OF IMPACT

- Not possible to add up impacts
  - There was a very large amount of numerical data (i.e. c170k, or c70k with dates removed) that was inconsistent in its use and would need converting into standard units
  - Some numerical data was not related to the actual impact; it may be associated with background information or, crucially the potential impact

- Six 'deep mine' questions to:
  - Illustrate both the richness of that case studies, but also some of the challenges associated with their analysis
  - Supplement the quantitative text mining analysis with a more nuanced qualitative assessment

THE SIX SELECTED 'DEEP MINES'

1. What is the impact and value of research on clinical practice and health gain?
2. What has been the impact of research on industry in terms of spin out companies, patents, royalties or licenses?
3. What has been the impact of research on public policy and parliamentary debate?
4. What has been the impact of research on film and theatre?
5. What has been the influence of the Wellcome Trust and British Academy?
6. What has been the impact of research on the BRIC countries?

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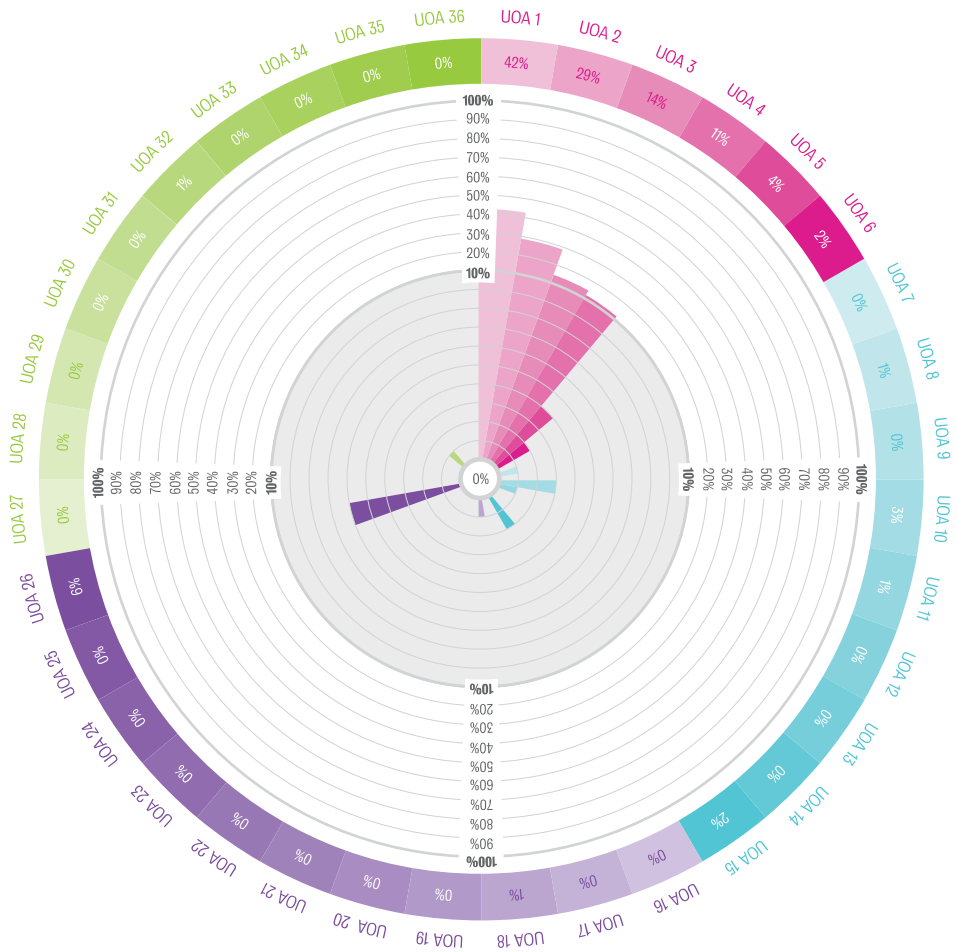

‘Clinical guidance’

(guidelin patient clinic treatment recommend stroke nice risk trial)

(n=326)

What is the impact and value of research on clinical practice and health gain?

- QALY: "Quality adjusted life years" (1 QALY = 1 year of life in 'perfect health')
  - 25 case studies (mostly from Panel A)
  - 14 used QALYs to determine cost effectiveness
  - 11 used QALYs to tell us actual health gain

£2B OF ESTIMATED NET MONETARY BENEFIT ARISING FROM 11 CASE STUDIES

		QALY gain per patient	No. of patients pa	Total QALY gain	QALY value	Net monetary benefit 2008-2012	*Comments*
Aromatase inhibitors	"Anastrolze head been estimate dto lead to a 0.26 QALY gain per patient"					£23,000,000	*Taken from Glover et al. Assume 4.7m pa for 5 years c QALY values at £25k*
Treatement of bilary tract cancer	"Total QALY ger gemcitabine/cisplatin (0.751) was greater than for gemcitabine along (0.561)"	0.19	1200		25,000	£5,700,000	
CVD and salt reducation	"This reduction is estimate to have adverted 20,000 CVD events in the UK, of which 8,500 would have been fatal with c131,000 QALYs gained"			131,000	25,000	£200,000,000	*Checked cited paper (http://www.bmj.com/content/343/bmj.d4044) - model suggests £40m pa savings; value of QALY not clear*
NSAIDs							*Needs additional information ie how many people treated*
Bowel cancer screening	"Equating to above 3,500 lives savied per annum"					£1,408,000,000	*Data take from Glover et al and projected for 2011 & 2012*
Primary angioplasty	"Estimated that over three year the policy would cost £44.4m and would yield £337.9m in benefits"					£48,916,667	*Prorated data for 5 years*
Deep vein thrombosis	"adopting the NICE recommendation … would result in a net benefit of £42,219 per 1000 patients with suspect DVT"		140000			£29,553,300	*Prorated data for 5 years*
Abdominal aortic aneurysms	"130,00 QALYs over the past 20 year period, and that the net value of the option adopted was £3,884m over 20 years, valuing the health beenfit at a social value of £40,000 per QALY gained"					£606,875,000	*Prorated for 5 years and with a QALY at £25k*
Artificial spinal implant	"QALY accural rate of 0.7 over 12 month"	0.7	226		25,000	£19,775,000	*Prorated for 5 years and with a QALY at £25k*
					Total	**£2,342 millions**	

Challenges in estimating monetary value in this small sample

- Inconsistent use of social value of a QALY
- Data needed to be manipulated to generate comparable estimates
- Had to introduce external data sources

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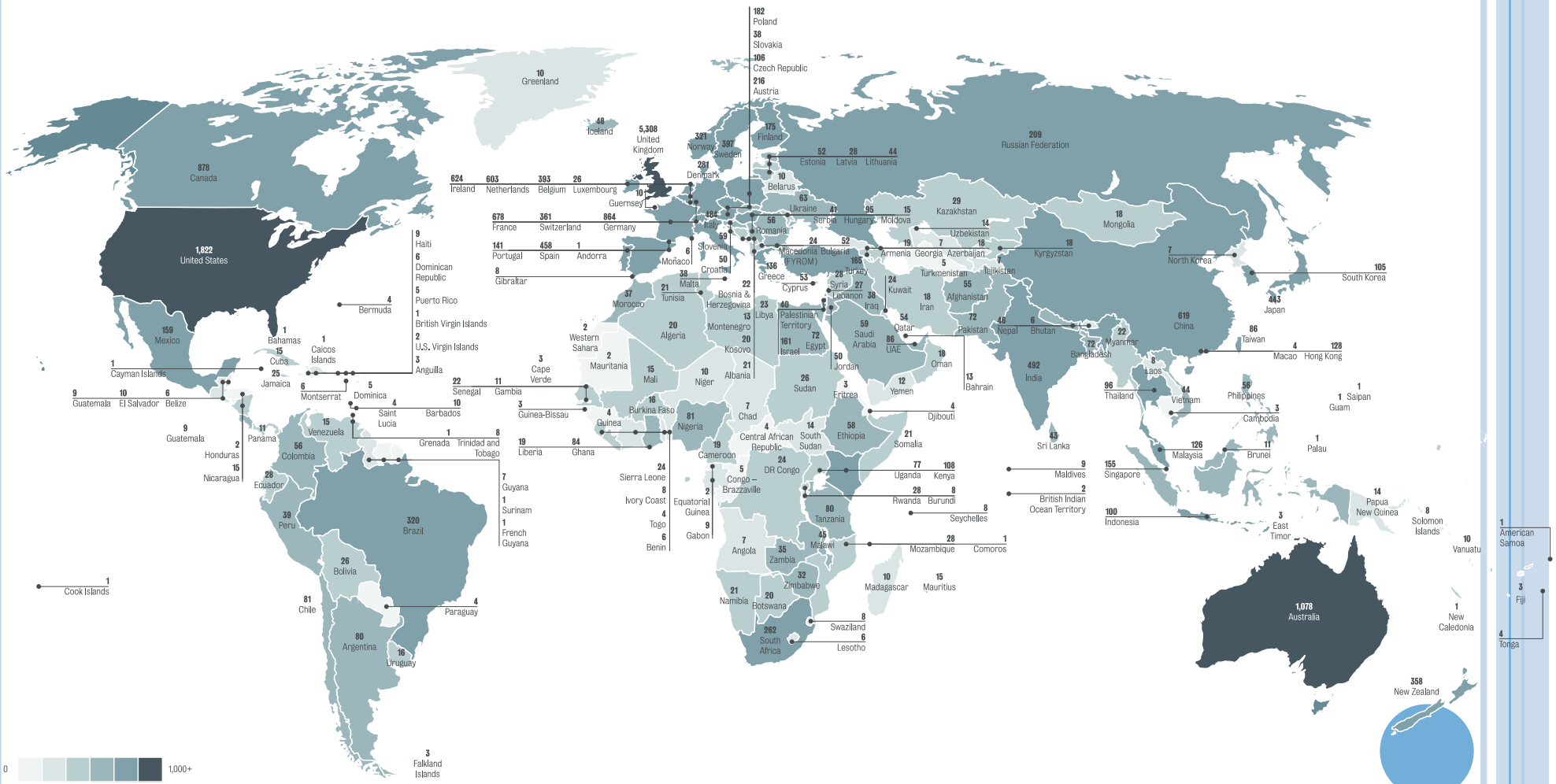
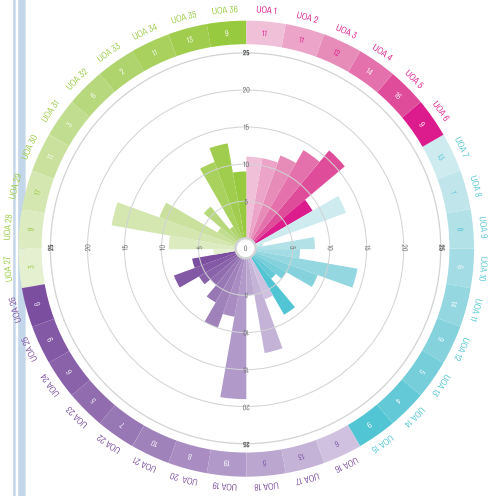
What has been the impact of research on the BRIC countries?

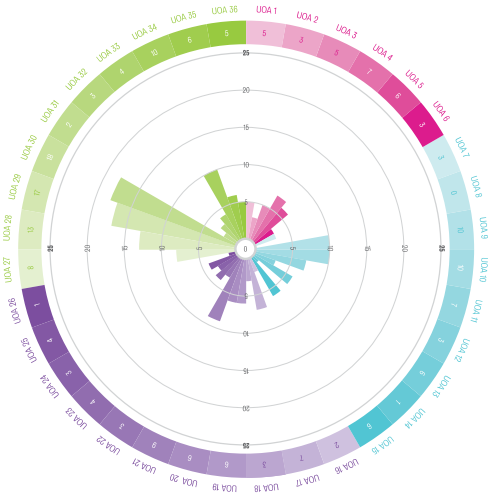
UK Higher Education Institutes have a global impact



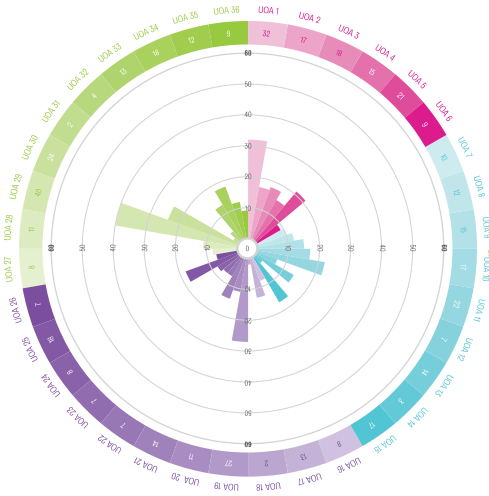
What has been the impact of research on the BRIC countries?



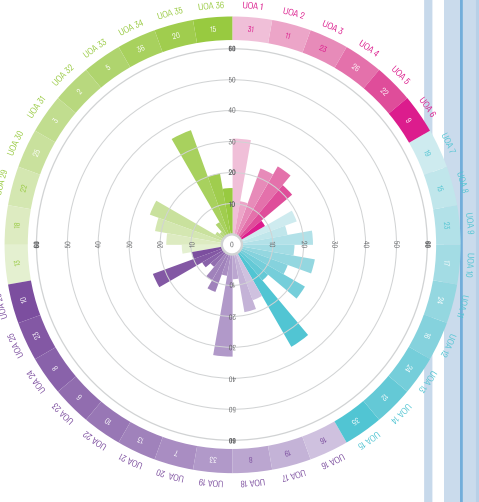
Brazil
n=320



Russia
n=209



India
n=492



China
n=619

What has been the impact of research on the BRIC countries?

- From a random sample of case studies (n=200)
  - Both incidental and strategic collaborations facilitated impact
  - Informing government policy
  - Creation of new technologies (and spinouts and licences, n=7)
  - Facilitating collaboration, especially academics
  - Creation of resources and training for teaching

!

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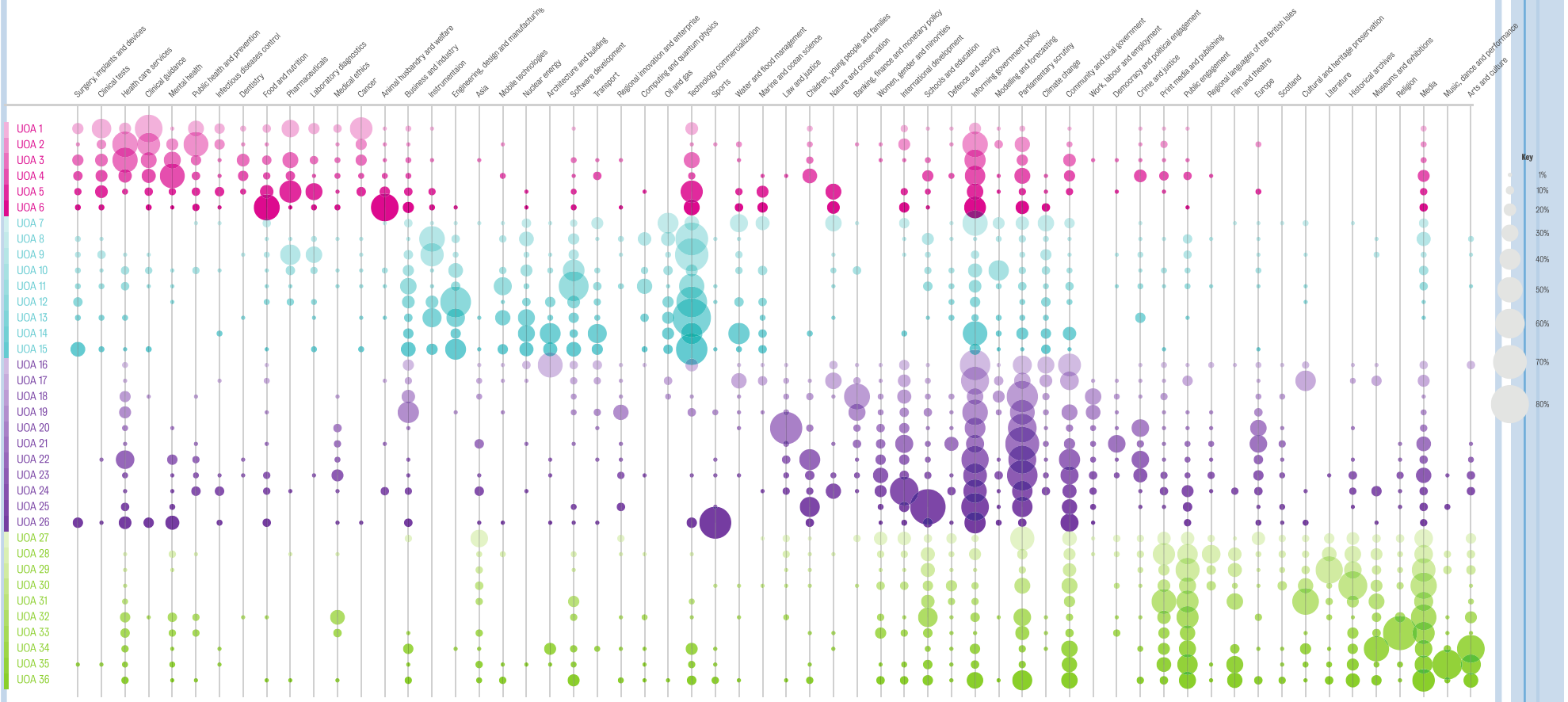
Potential for cross-analysis

Cross analysis options



Cross analysis options

60 IMPACT TOPICS

Informing government policy

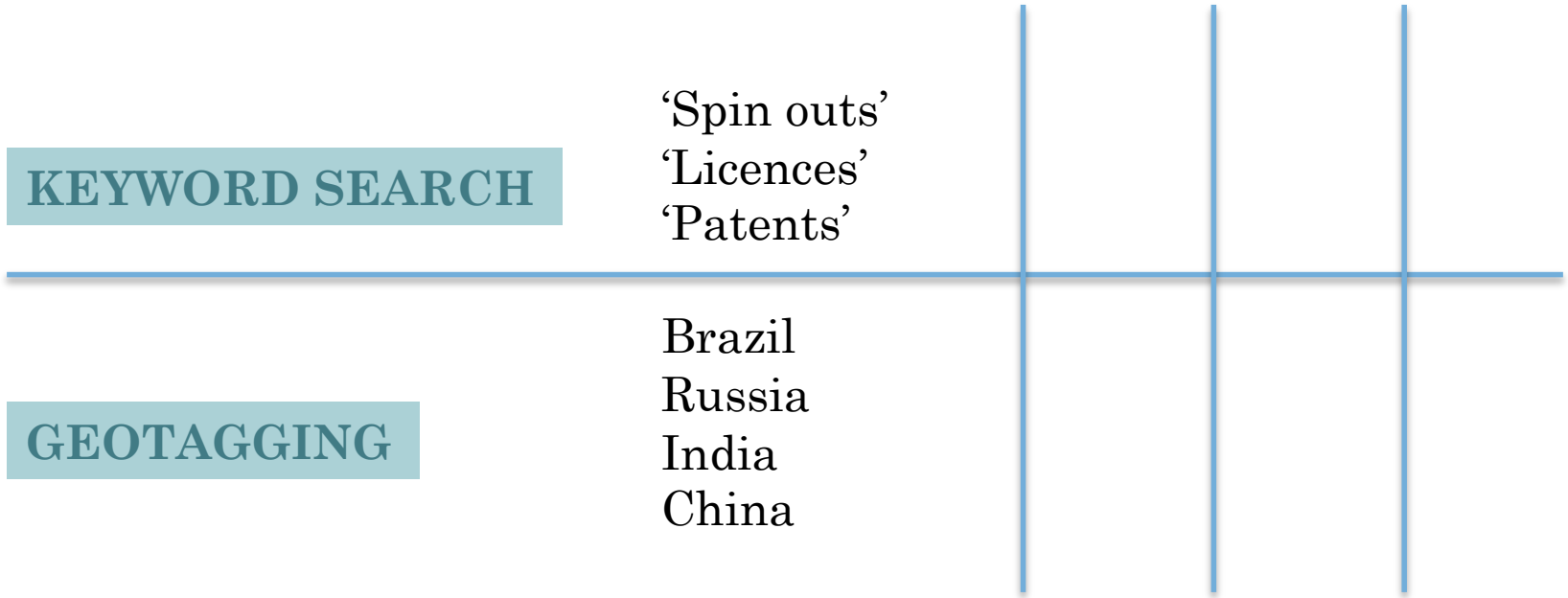
Technology commercialisation

KEYWORD SEARCH

‘Spin outs’
‘Licences’
‘Patents’

GEOTAGGING

Brazil
Russia
India
China



What did we learn?

1. It is possible to analyse impact from narrative text
   - Text mining is a powerful tool to make sense of the data
   - Qualitative analyses complement these methods
   - Further quantitative tools could be used with better numerical data
2. Research impact is multidisciplinary, multi-impactful, and multinational
3. The quantitative evidence supporting claims for impact was diverse and inconsistent, suggesting that the development of robust impact metrics is unlikely
4. The use of standardised lists of information and the definitions in the case studies would aid future analysis
   - Numerical data
   - Institutions & organisations

ACKNOWLEDGEMENTS

The Policy Institute at King's

King's College London
Digital Humanities

DIGITAL science

Cyngor Cyllido Addysg Uwch Cymru
Higher Education Funding Council for Wales
hefcw

HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND
hefce

RESEARCH COUNCILS UK

Department for Employment and Learning
www.delni.gov.uk

wellcome trust

Scottish Funding Council
Promoting further and higher education