

UK-CRIS Continuing the journey

Building on Success



Informatics Innovation in Mental Health & Dementias Research

CRIS at SLaM

2009

D-CRIS

2013

UK-CRIS

2015-2018

10 Years of successful initiatives

UK-CRIS PROGRAMME



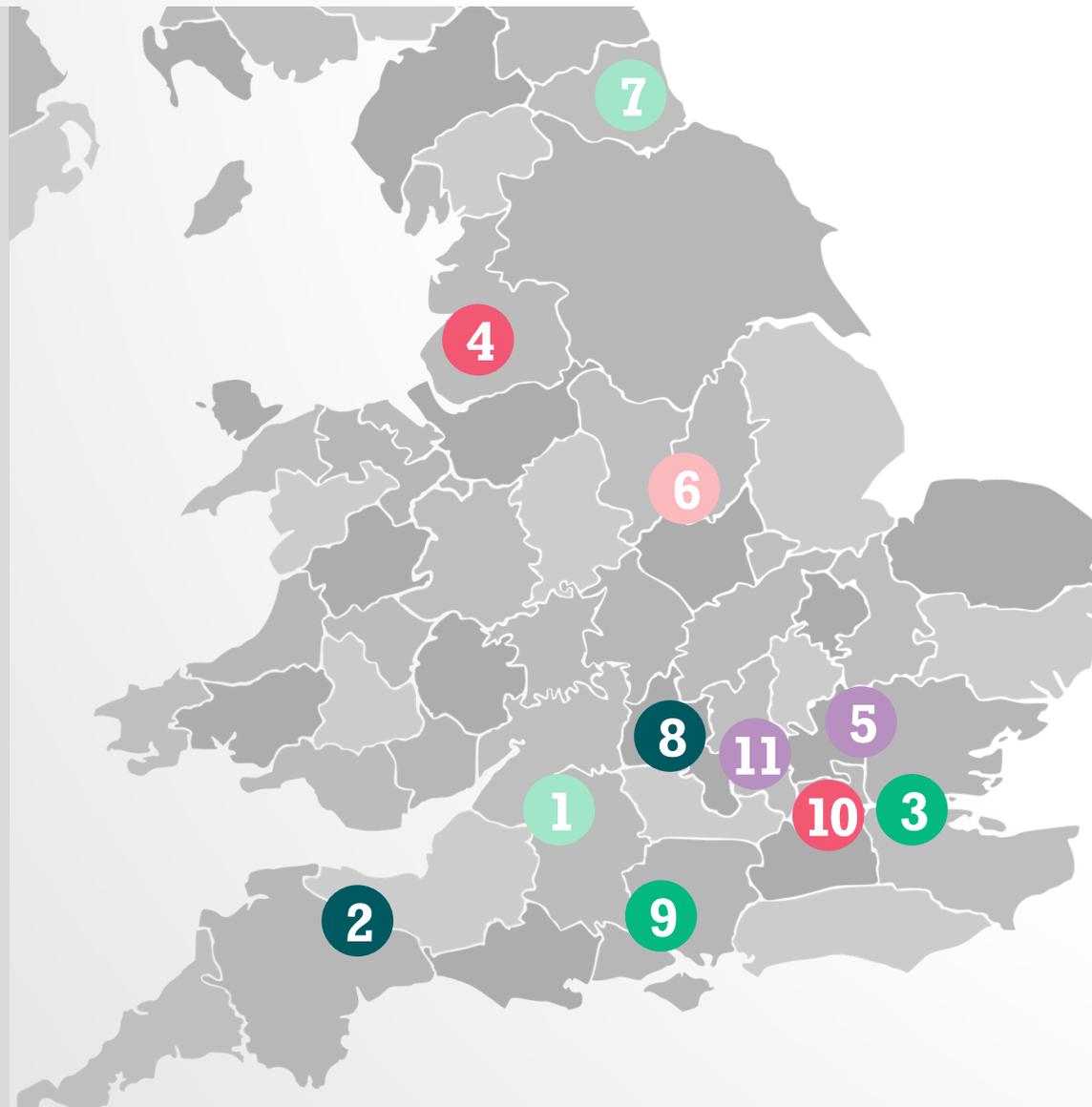
- **10 Trusts identified to implement the CRIS solution, sites selected by proximity to UK Biobank recruitment centres**
- **Implementation of 'Federated Querying' to enable scale**
- **Identify and Implement Data Harmonisation model**
- **Linkage with 500k UK-Biobank healthy volunteer cohort**

UK-CRIS Sites



11
NHS Trusts

2.2m+
De-identified electronic
patient records



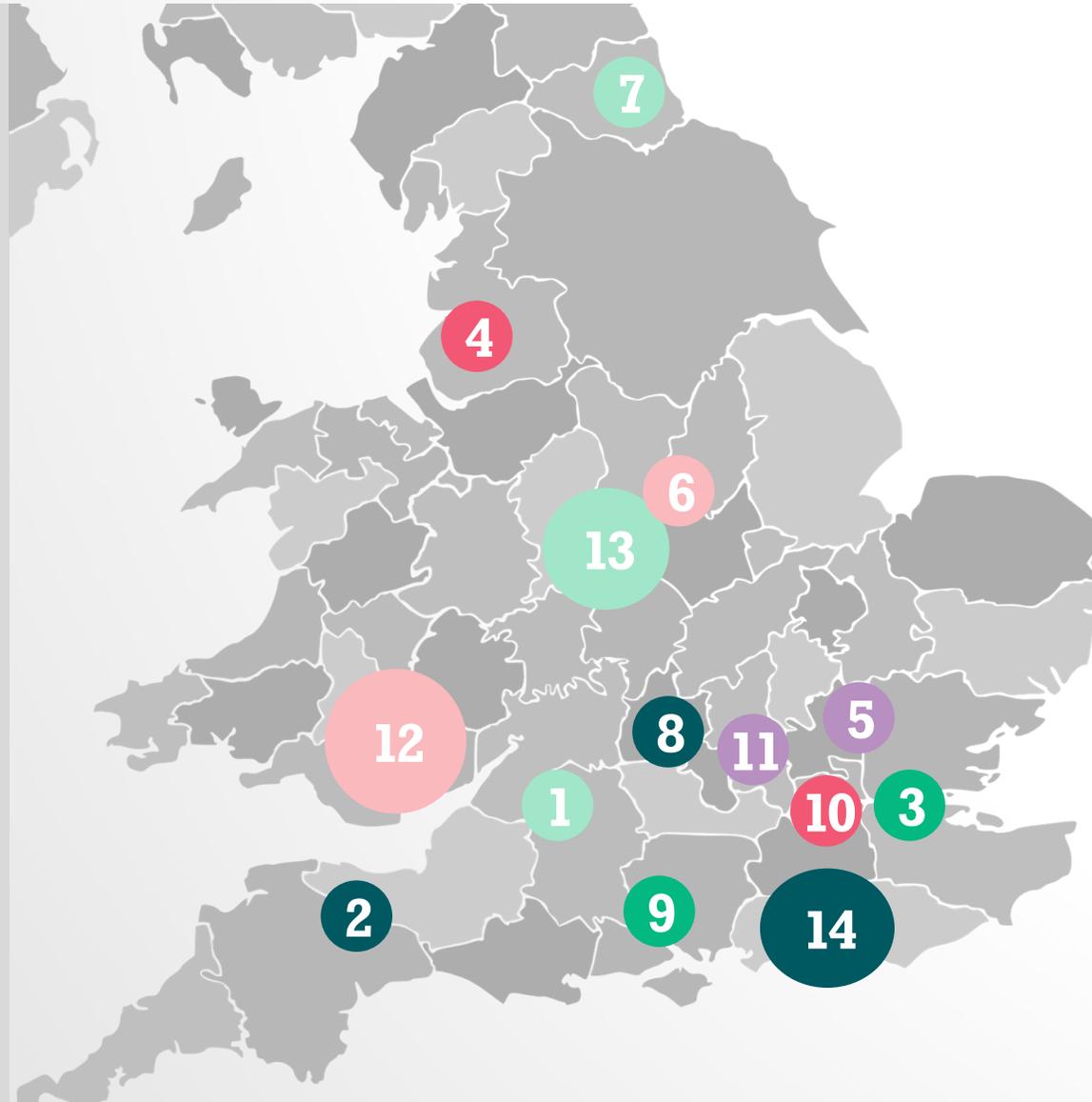
- Avon and Wiltshire Mental Health Partnership NHS Trust **1**
- Devon Partnership NHS Trust **2**
- Kent and Medway NHS and Social Care Partnership NHS Trust **3**
- Mersey Care NHS Trust **4**
- North East London NHS Foundation Trust **5**
- Nottinghamshire Healthcare NHS Foundation Trust **6**
- Northumberland, Tyne and Wear NHS Foundation Trust **7**
- Oxford Health NHS Foundation Trust **8**
- Southern Health NHS Foundation NHS Trust **9**
- South West London and St Georges NHS Mental Health NHS Trust **10**
- West London Mental Health NHS Trust **11**

UK-CRIS Sites by March 2019



14
NHS Trusts

2.75m+
De-identified electronic
patient records



- Avon and Wiltshire Mental Health Partnership NHS Trust 1
- Devon Partnership NHS Trust 2
- Kent and Medway NHS and Social Care Partnership NHS Trust 3
- Mersey Care NHS Trust 4
- North East London NHS Foundation Trust 5
- Nottinghamshire Healthcare NHS Foundation Trust 6
- Northumberland, Tyne and Wear NHS Foundation Trust 7
- Oxford Health NHS Foundation Trust 8
- Southern Health NHS Foundation NHS Trust 9
- South West London and St Georges NHS Mental Health NHS Trust 10
- West London Mental Health NHS Trust 11
- Cardiff and Vale University Health Board 12
- Birmingham and Solihull Mental Health Foundation Trust 13
- Sussex Partnership NHS Foundation Trust 14

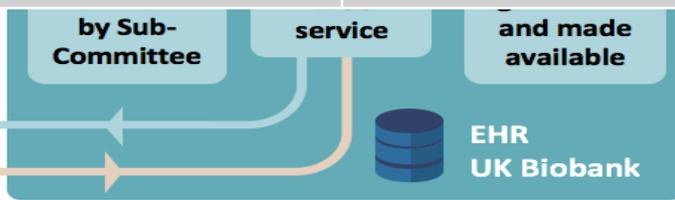
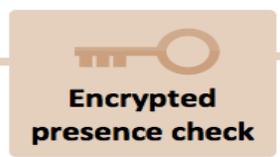
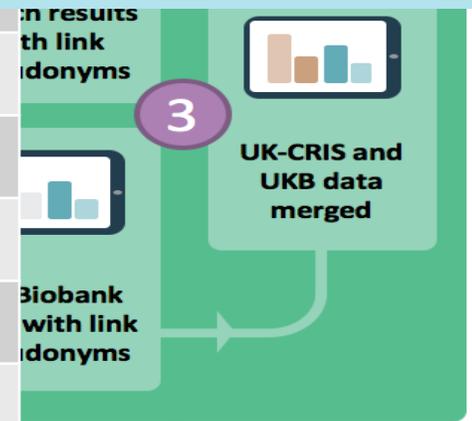
UK Biobank Linkage

Diagnosis

- Anxiety
- Bipolar
- Dementia/Alzheimer's
- Depression (mild, mod, severe)
- Mild cognitive disorder

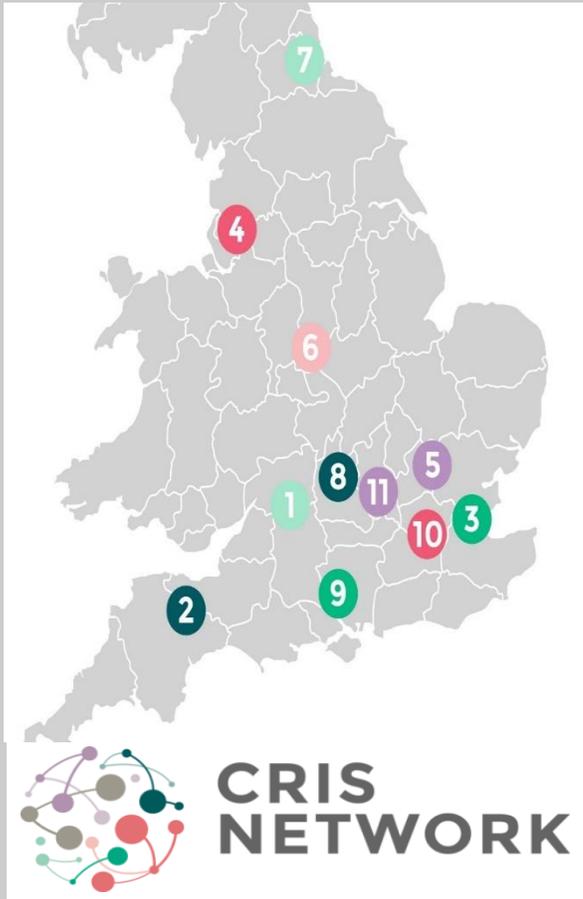
- IAPT
- HIC Acute
- QResearch (Primary Care, HES, ONS, Cancer Registry)
- ALSPAC (Parents & children)
- Imaging and Bioresource
- True Colours

No diagnosis	333	6833
Other	46	944
Personality disorder	14	287
Recurrent depression	39	800
Schizophrenia	18	369
Grand total	731	15000



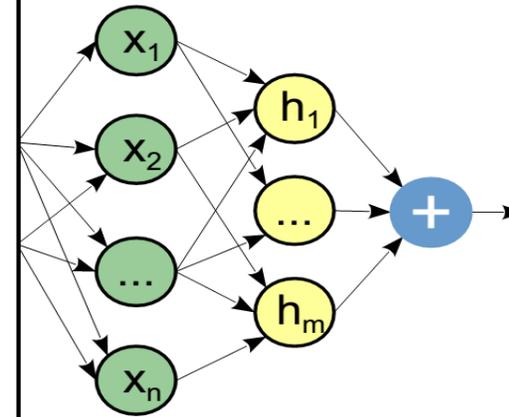
DATA SCIENCE

NLP projects



		e							
Patient	→	0.8	0.7	0.0	0.0	0.4	0.6	0.7	w
86	→	0.2	0.3	0.7	0.2	0.2	0.4	0.3	
w	→	0.0	0.0	0.1	0.1	0.5	0.3	0.2	
arthritis	→	0.6	0.8	0.0	0.0	0.1	0.2	0.8	
,	→	0.0	0.0	0.3	0.9	0.0	0.0	0.0	
takes	→	0.1	0.2	0.2	0.0	0.8	0.3	0.5	
diclofenac	→	0.7	0.6	0.1	0.0	0.0	0.0	0.9	
100	→	0.2	0.3	0.8	0.2	0.0	0.0	0.4	
QD	→	0.2	0.4	0.5	0.3	0.3	0.6	0.8	

Patient, 78, retired constuction worker. Prior history of depression on his 50s with intrusive thoughts, which has been properly controlled with citalopram 20 mgs daily ever since. Compalins now about memory problems and confussion in the morning. MMSE today was 28. Scored 29 on May 2015. Wife thinks he simply overworries since he retired one year ago.



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Medical terms extraction with NNs

Term	Context free FFN	Context aware FFN	RNN	I2B2 winner
Medication	79.0	88.9	94.6	90.3
Dosage	71.0	91.0	93.0	90.8
Mode	95.4	92.7	96.9	89.3
Frequency	79.8	88.5	90.9	87.7
Duration	31.7	61.9	63.0	56.0
Reason	26.5	28.1	28.4	47.0

Table 6: Performance on I2B2 2009 objective task. The table shows F1 scores for each of our three architectures on extracting each of the target terms of I2B2 2009. For comparison, results of the winners of I2B2 challenge are also provided in the last column.

Luka Gligic



Concepts extraction

- We participated in

National NLP Clinical Challenges (n2c2)

2018 Track 2: Adverse Drug Events and Medication
Extraction in EHRs



- Our language model extracted 9 concepts:

Concept	# of entities	Examples
Drugs	2000+	'aspirin', 'citalopram', 'trazodone'
Strength	800+	'20mg', '325 units', '50 mg'
Dose	200+	'low dose', 'sliding scale', '1-2', '3 units', '10cc', '4 litres',
Duration	600+	'for seven days', 'standing', 'prn', '8 days', 'for 5 days'
Frequency	200+	'b.i.d', 'ongoing', 'daily', 'as needed', 'q6h', 'every 6 hours', 'qod', 'tid'
Form	150+	'mdi', 'patch', 'tabs', 'tablet', 'capsule', 'tablet'
Route	150+	'gtt', 'topical', 'inhalation', 'nebulization', 'injections'
Reason	1600+	'recurrent seizures', 'agitation', 'asthma', 'wheezing'

Concepts extraction

- We participated in

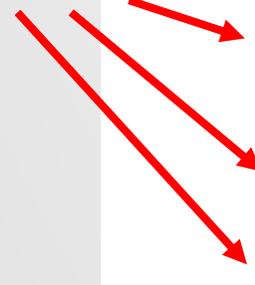
National NLP Clinical Challenges (n2c2)

2018 Track 2: Adverse Drug Events and Medication
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- Our language model extracted 9 concepts (results):

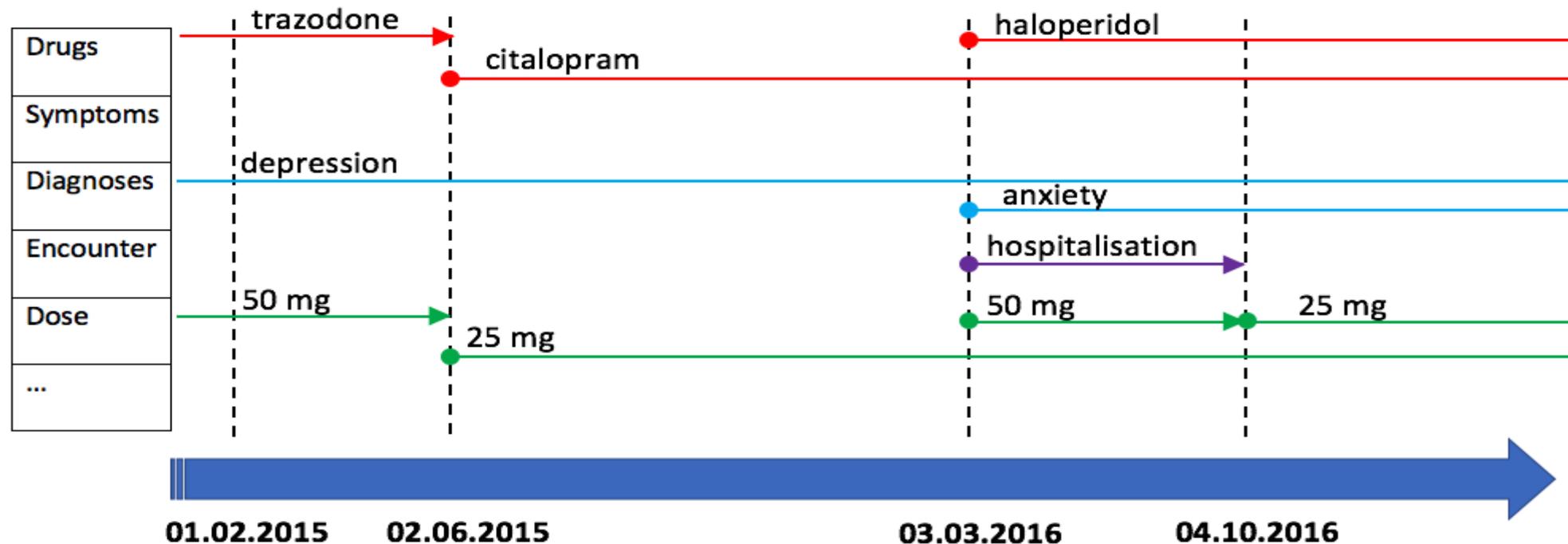
worst results



```
***** TRACK 2 *****
----- strict -----
Prec.  Rec.  F(b=1)
Drug   0.7757 0.9144 0.8394
Strength 0.8647 0.9066 0.8852
Duration 0.6314 0.6164 0.6238
Route  0.8515 0.9499 0.8980
Form   0.8759 0.9080 0.8916
Ade    0.1959 0.2880 0.2332
Dosage 0.7977 0.9060 0.8484
Reason 0.2238 0.5705 0.3215
Frequency 0.8248 0.8153 0.8200
-----
Overall (micro) 0.7069 0.8617 0.7767
Overall (macro) 0.6850 0.8543 0.7567
----- lenient -----
Prec.  Rec.  F(b=1)
Drug   0.8085 0.9483 0.8728
Strength 0.9112 0.9530 0.9316
Duration 0.7038 0.6852 0.6944
Route  0.8629 0.9601 0.9089
Form   0.9136 0.9459 0.9294
Ade    0.2133 0.3136 0.2539
Dosage 0.8300 0.9418 0.8824
Reason 0.2564 0.6523 0.3681
Frequency 0.9601 0.9487 0.9544
-----
Overall (micro) 0.7497 0.9114 0.8227
Overall (macro) 0.7272 0.9038 0.8022
```

Concepts extraction: individual timeline

BRC_ID	Date	Clinical text summary
QJ748RT	01.02.2015	I saw XXXX today in a clinic, taking Trazodone 50mg, diagnosed with depression
QJ748RT	02.06.2015	Could not tolerate Trazodone, replaced with citalopram 25mg, QIDS score 14
QJ748RT	03.03.2016	XXXX has been hospitalised due to deterioration, now added haloperidol 50mg, suicidal thoughts and anxiety
QJ748RT	04.10.2016	XXXX seen today, looks very good, reduced haloperidol to 25 mg, QIDS 5, keep citalopram 25 mg prn



AND SO FINALLY...



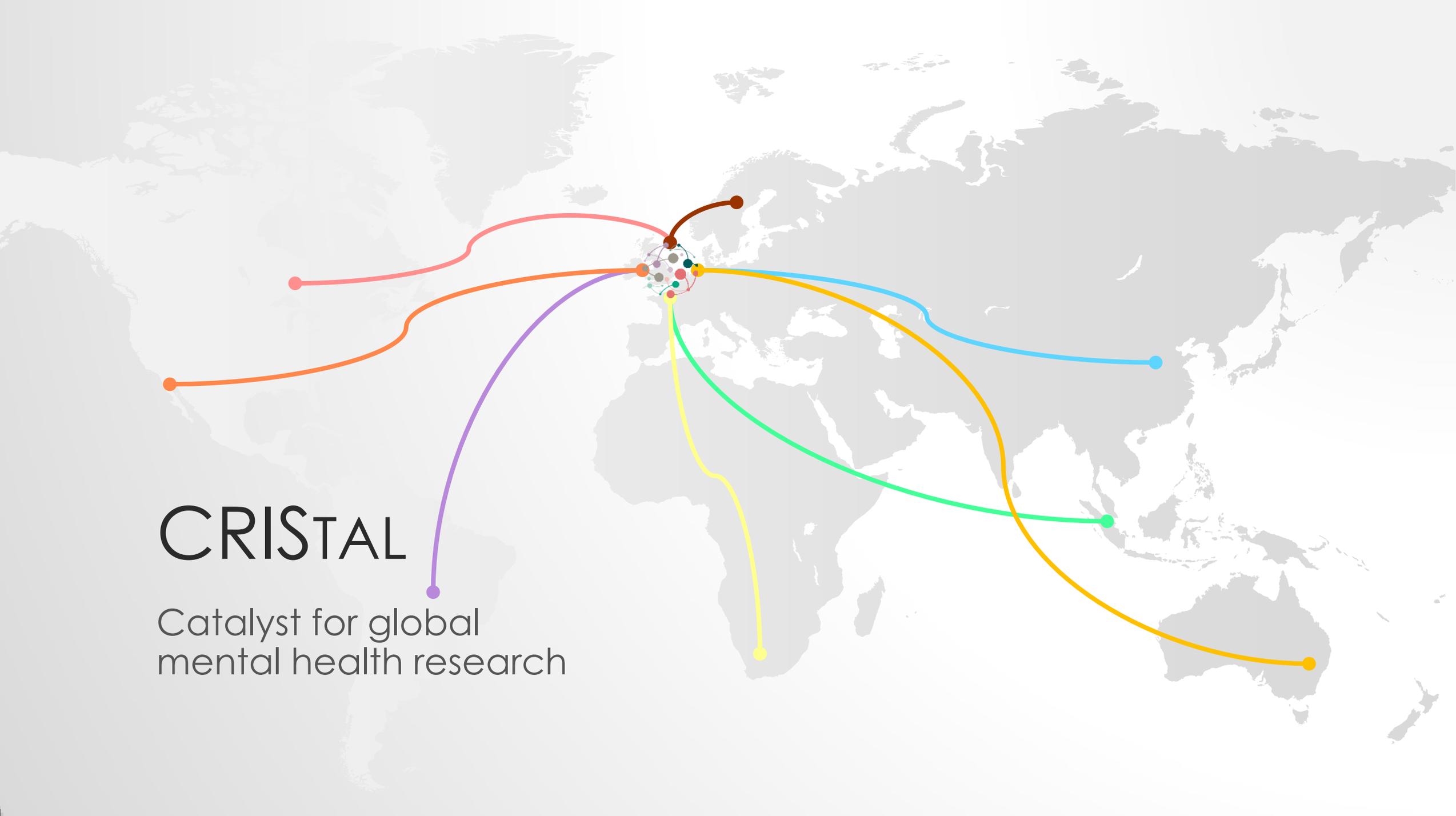
- There are very few things in life worth celebrating a decade of

- Congratulations to SLaM

and the future?

- Thanks to Funders - NIHR and MRC





CRISTAL

Catalyst for global
mental health research