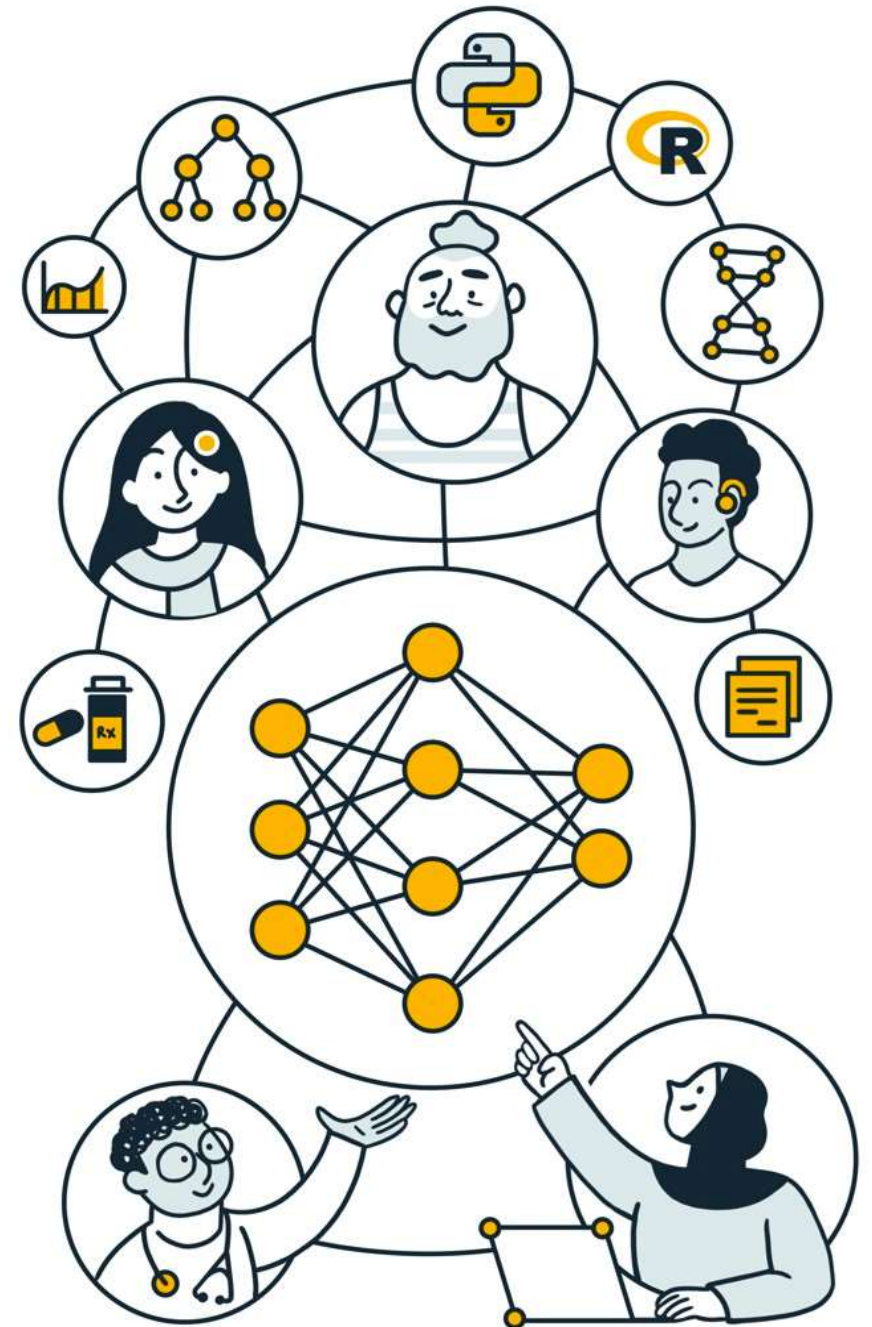




AI for Multiple Long-term Conditions  
Research Support Facility

# Building capacity in data science for MLTC research: the AIM RSF approach

**Kirstie Whitaker**  
Pronouns: she/her



# Research Programme Director for Tools, Practices & Systems The Alan Turing Institute



# AI for Multiple Long Term Conditions

- Purpose: Develop insights into the identification and subsequent prevention of MLTC
  - “Spearhead the use of advanced data science and AI methods - combined with existing methodology and expertise in clinical practice, applied health and care research and social science - to systematically identify new clusters of disease and the development of conditions over the life course.”
  - “Grow capacity and capability for multi-disciplinary working in MLTC-M for the benefit of patients, practitioners and the public.”
- In 2020-2021 the £23m call supported seven research collaborations and partnerships between leading academic institutions, health and care researchers, AI experts, and practitioners.
  - Additionally funded a Research Support Facility (RSF) to work with Research Collaborations



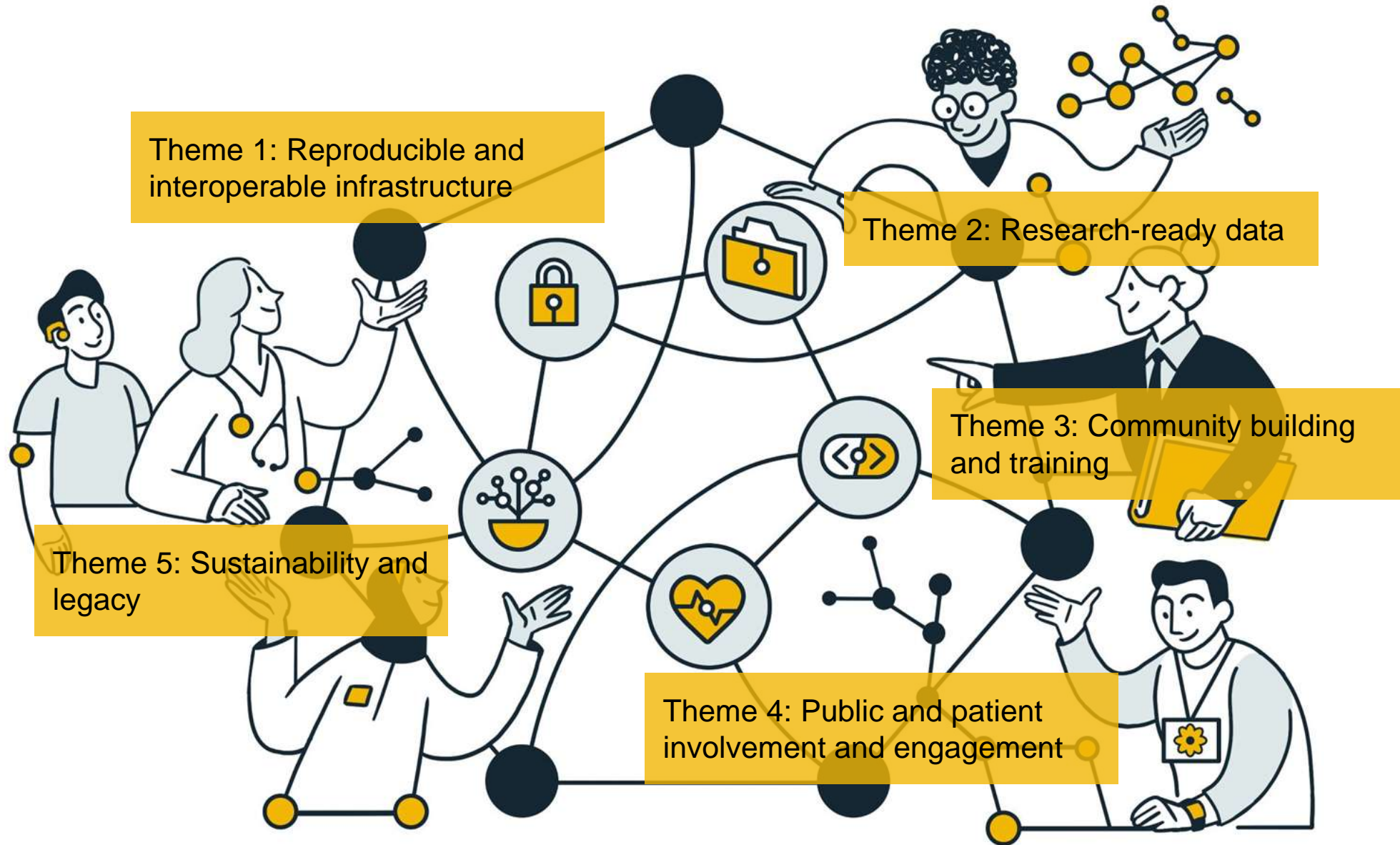
FUNDED BY

**NIHR** | National Institute for  
Health and Care Research

# AI for Multiple Long Term Conditions

- [AIM-CISC](#): Analyse and understand which patterns of multimorbidity are most common, which most affect people's lives, and help improve the quality and safety of care.
  - University of Edinburgh, The Roslin Institute, NHS Lothian, and University College London.
- [AI-MULTIPLY](#): Characterise the dynamic relationships of MLTC and polypharmacy and inform healthcare pathways.
  - University of Newcastle and Queen Mary University.
- [Cluster-AIM](#): Develop and validate population clusters to integrate health and social care using mixed methods.
  - Southampton, Oxford, Kent, Nottingham and Leicester.
- [DECODE](#): Mapping the challenges and requirements for Data-driven, machine learning-aided stratification and management of multiple long-term Conditions in adults with intellectual Disabilities (ID).
  - Leicestershire NHS Trust, Loughborough University, University of Leicester, and De Montfort University.
- [DynAIRx](#): Develop new, easy-to-use AI and data visualisation tools that help GPs and pharmacists treat patients with MLTC.
  - Liverpool, Leeds, Manchester and Glasgow.
- [MELD-B](#): Identify life-course time points and targets for the prevention of early-onset, burdensome Multiple Long-Term Conditions.
  - University of Southampton, University of Glasgow, Swansea University, Southampton City Council, University of Aberdeen, and King's College London.
- [OPTIMAL](#): OPTIMising therapies, discovering therapeutic targets and AI-assisted clinical management for patients living with complex multiple long-term conditions.
  - University of Birmingham, University of Manchester, University Hospitals Birmingham NHS Trust, NHS Greater Glasgow & Clyde, and University of St Andrews.





Theme 1: Reproducible and interoperable infrastructure

Theme 2: Research-ready data



The Alan Turing Institute



THE UNIVERSITY of EDINBURGH



Theme 3: Community building and training

Theme 4: Public and patient involvement and engagement

Programme management



Theme 5: Sustainability and legacy

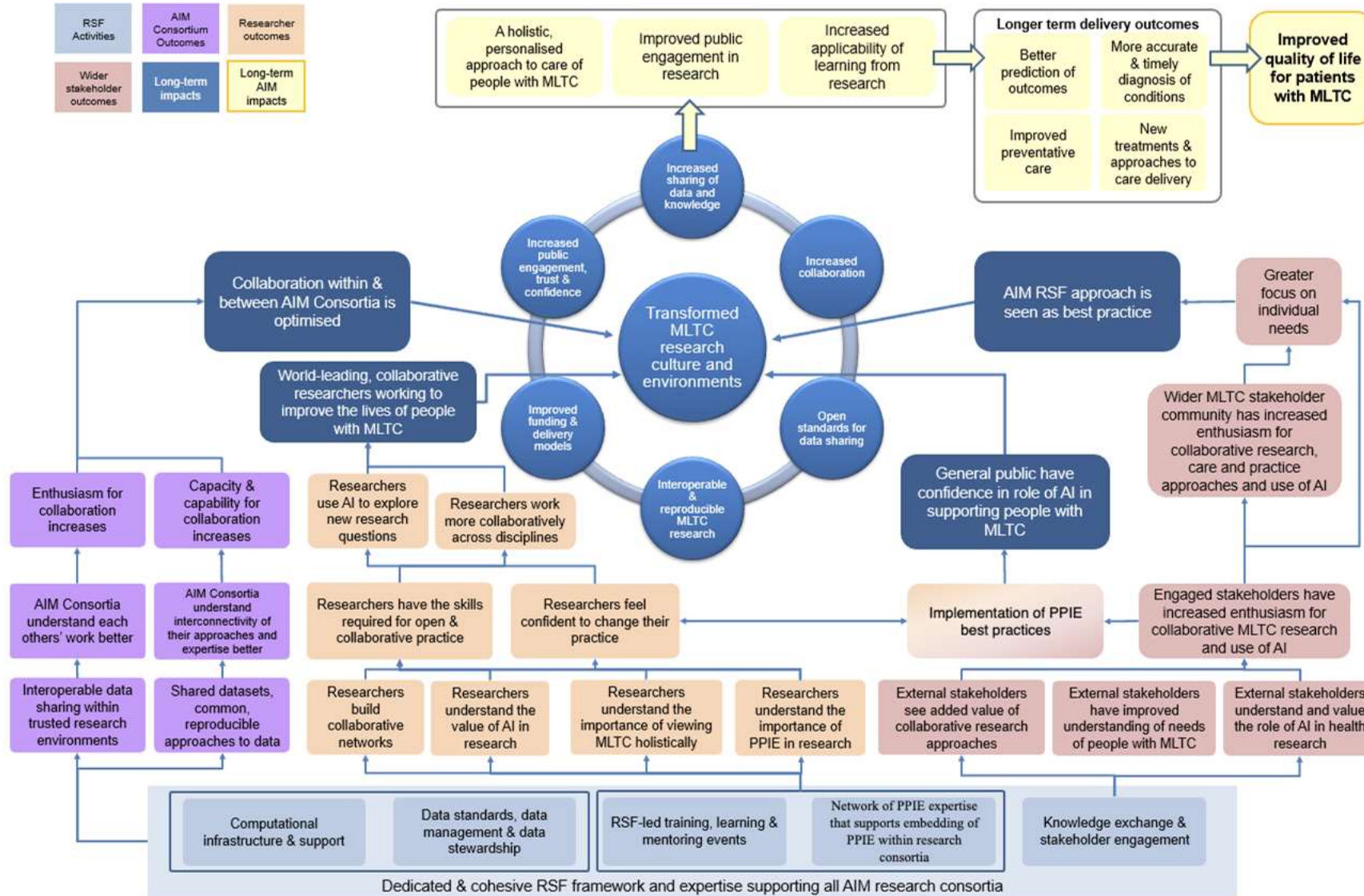


The AIM RSF Team

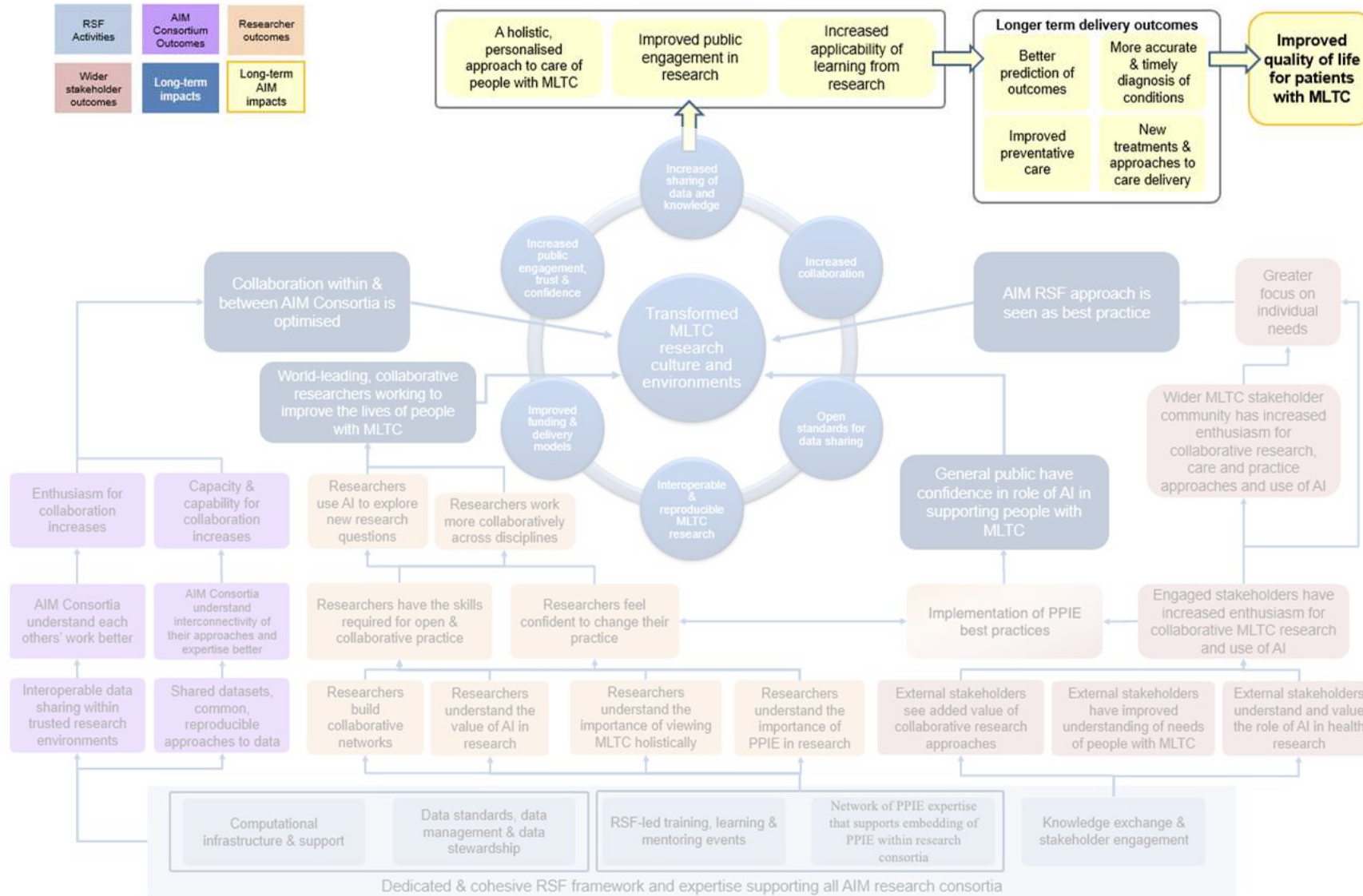
- David Ford
- Ronan Lyons
- Chris Orton
- Reece Labrom
- Ann-Marie Mallon
- Rachael Stickland
- Mahwish Mohammad
- Evelina Gabasova

- Emma Karoune
- Bastian Greshake Tzovaras
- Sophia Batchelor
- Aziz Sheikh
- Monica Fletcher
- Beth Collop
- Kirstie Whitaker
- Sydney Ambrose
- Batool Almarzouq

# AIM RSF Theory of Change

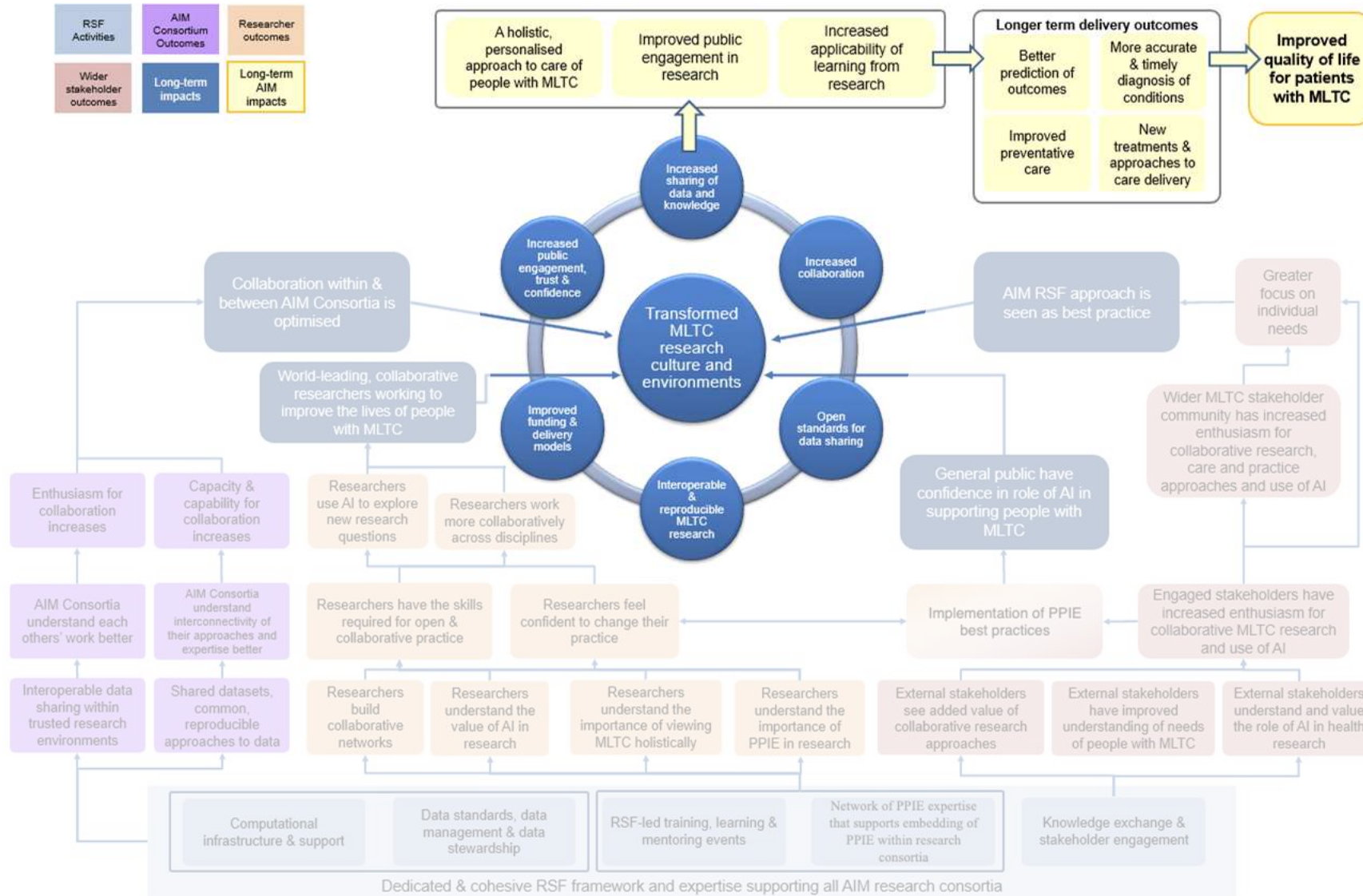


# AIM RSF Theory of Change

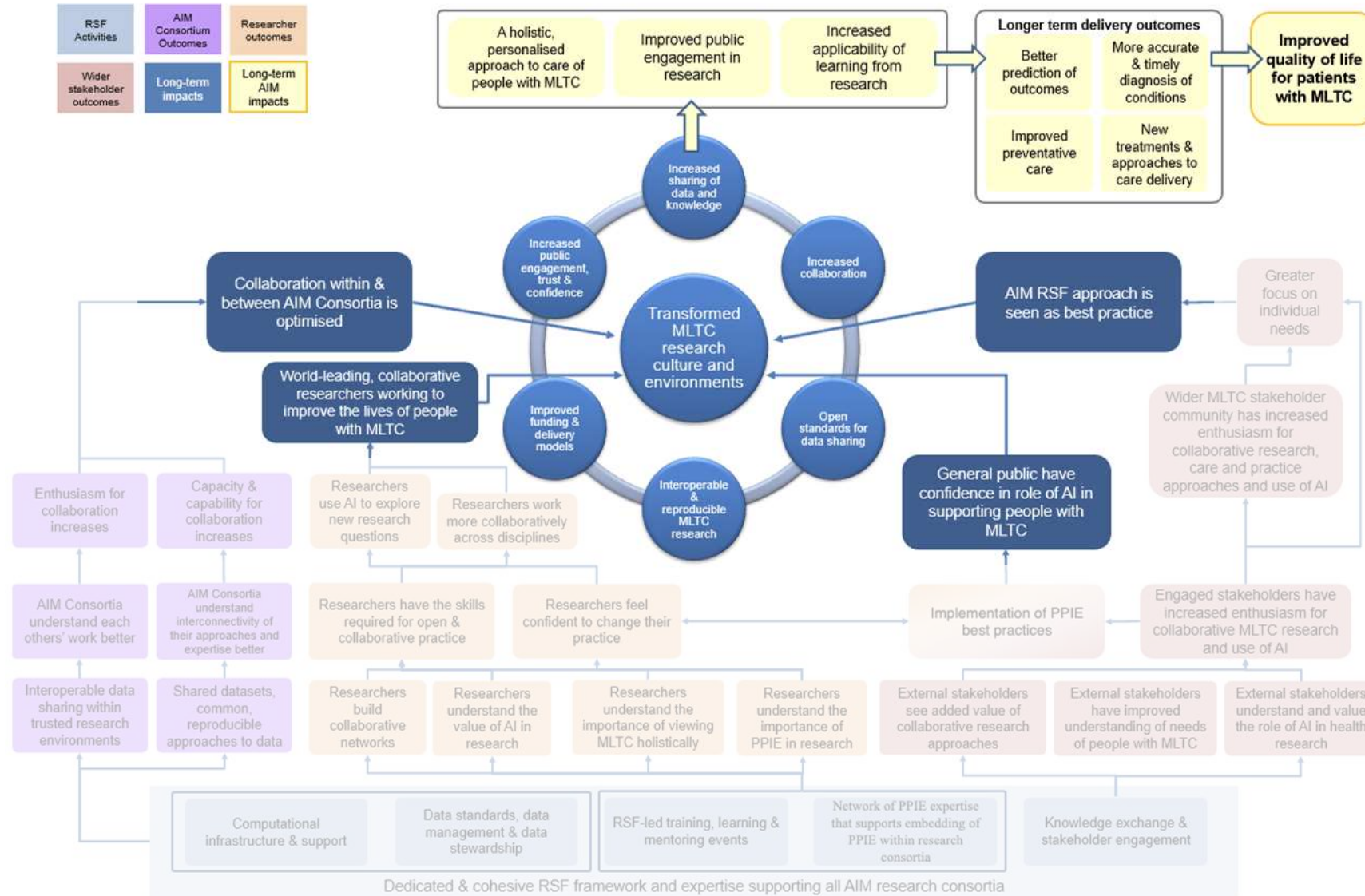




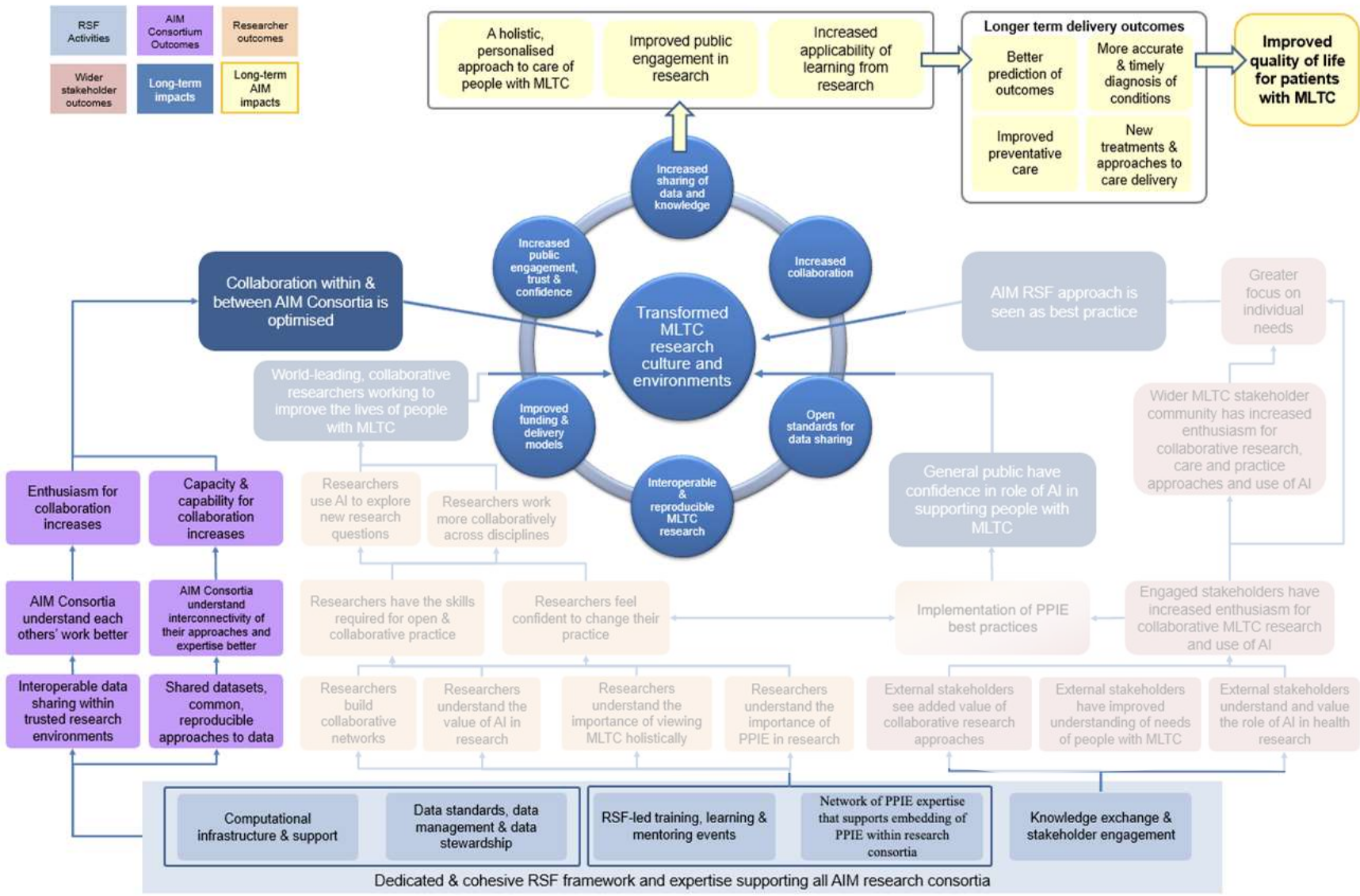
# AIM RSF Theory of Change



# AIM RSF Theory of Change



# AIM RSF Theory of Change



# Collaboration between and within AIM Consortia is optimised

- Driven by researcher need, specifically the DECODE and MELD-B projects, AIM RSF team have facilitated access and use of GPUs at the SAIL Databank at Swansea University.
- Currently working on a horizon scan of Trusted Research Environments appropriate for health data analysis across the UK.
- Working closely with the Clinical Practice Research Datalink team:
  - Gathered and compiled feedback on application procedures, access waiting times, data license agreements and infrastructure.
  - Accessed synthetic data to develop analytical workflows in open source programming languages curated to the CPRD datasets.



# Collaboration between and within AIM Consortia is optimised

*“RSF has created a community of collaboration” – Simon Fraser, MELD-B PI*

*“The co-ordinating and communicating pieces wouldn’t happen without dedicated resource [from the RSF]” – Thomas Jun, DECODE PI*

- Regular cross-consortia meetings: PIs, project managers and ECRs
  - Appropriate level of detail and actions rather than percolating all information through senior leadership
- Hybrid conference
  - May 2023, internal to AIM Consortia and RSF in Birmingham
  - Diverse attendance: 10% Experts by lived experience, 16% clinical staff, 24% postdoctoral researchers
  - Online facilitators, meal reimbursements and accessibility fund
- Save the date for our open conference on 9 September in Manchester!



# Collaboration between and within AIM Consortia is optimised

ECR Network Day in  
November 2023

*“Brilliant opportunity to learn from and connect with your peers in the community, who you might otherwise take years to meet in person with”*

*“This was a fantastic event and a great opportunity for collaboration”*

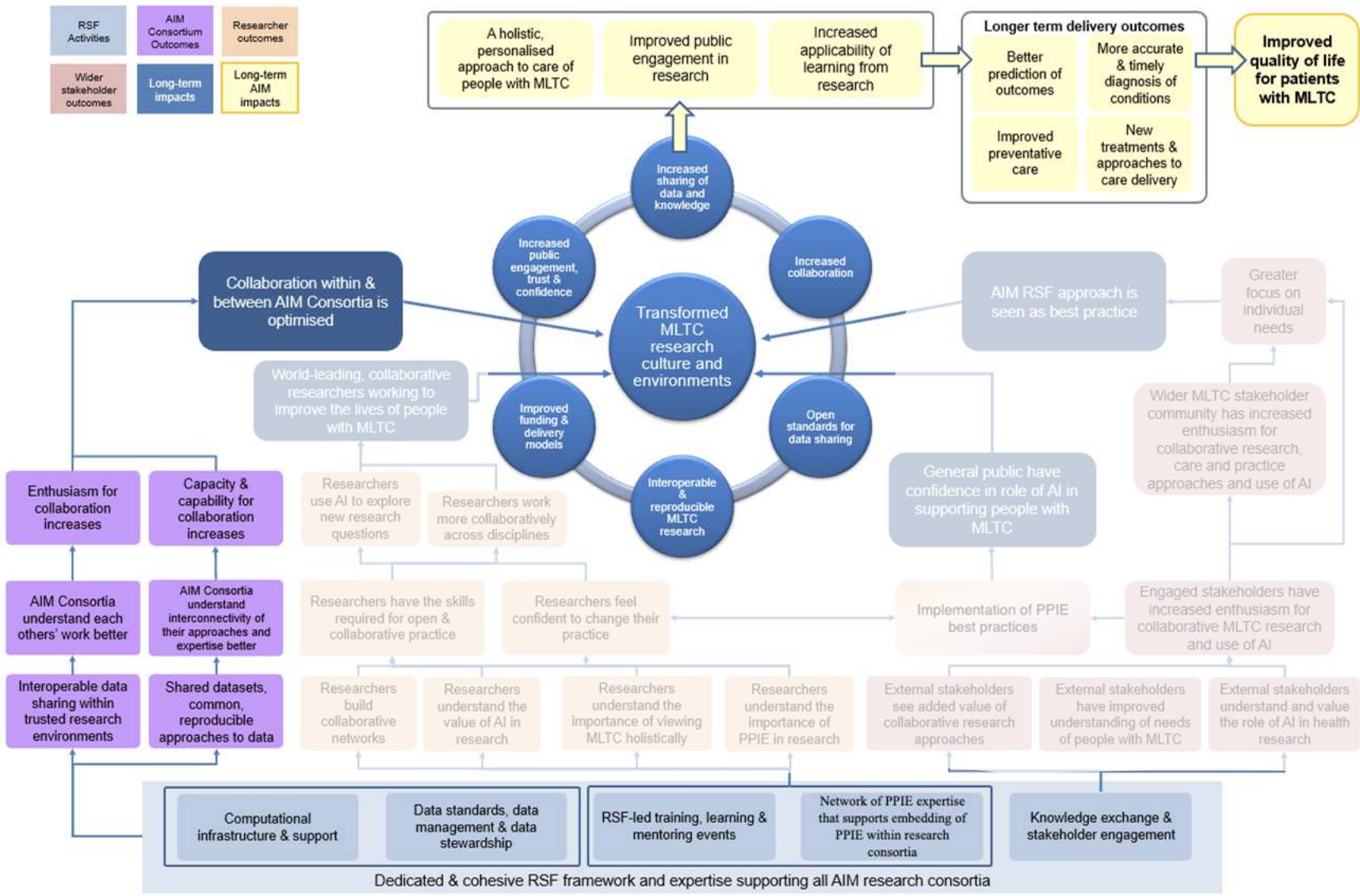
*“We need to do this more often!”*



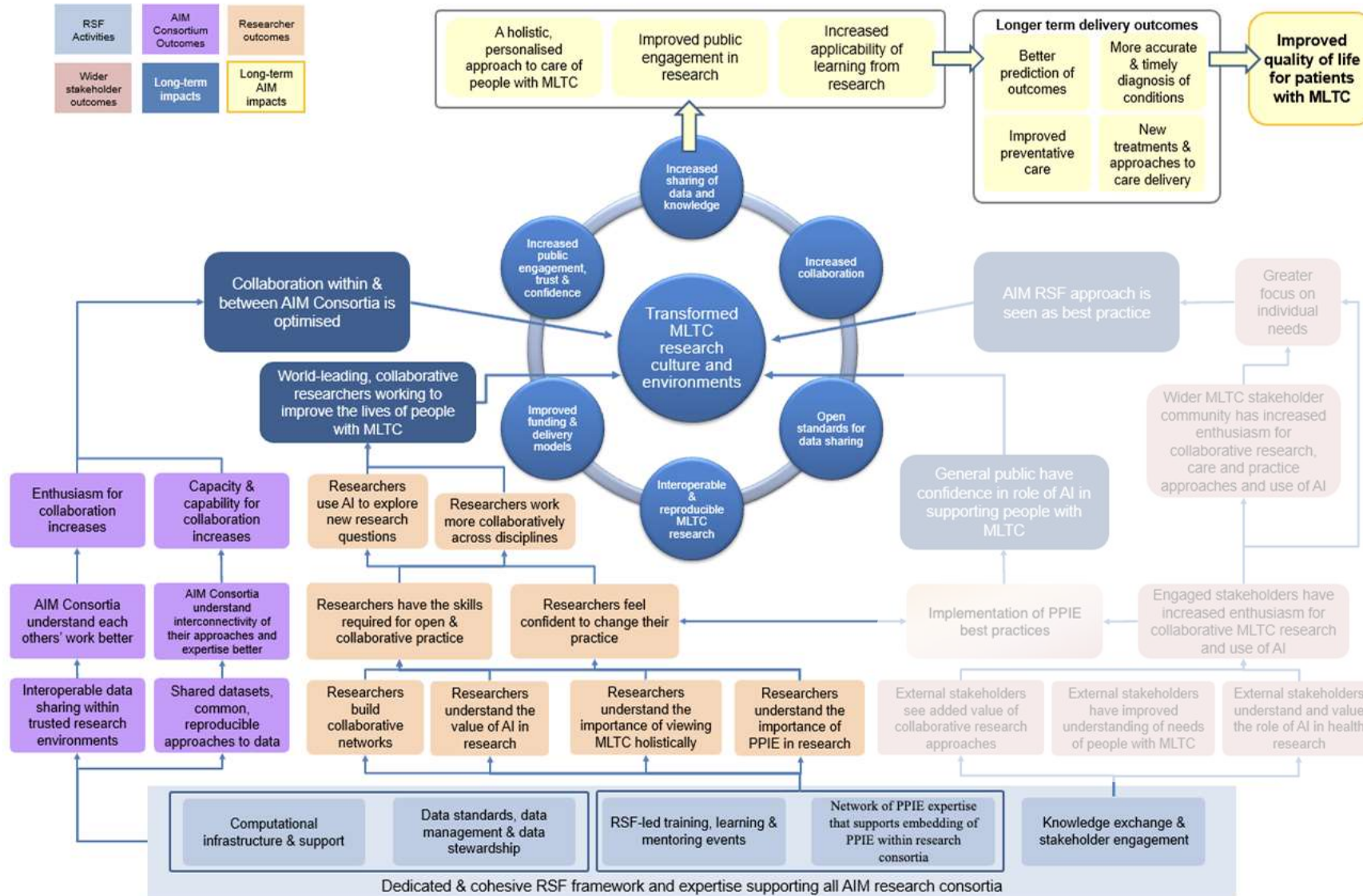
<https://github.com/aim-rsf/AIM-ECR-network>  
[https://github.com/aim-rsf/AIM-ECR-network/blob/main/ECR-days/  
London-23-Nov/planning-docs/ReproHack.md](https://github.com/aim-rsf/AIM-ECR-network/blob/main/ECR-days/London-23-Nov/planning-docs/ReproHack.md)

<https://doi.org/10.5281/zenodo.10992603>

# AIM RSF Theory of Change



# AIM RSF Theory of Change





# World-leading, collaborative researchers working to improve the lives of people with MLTC

- Committed to sustainability that transcends the lifetime of the AIM funding.
- Encouraging and demonstrating a shared and reproducible approach to the use and development of resources, tools and methods.
- Open source trainings available for anyone to use and reuse on:
  - Version control with git and GitHub
  - Introduction to GitHub for Collaboration
  - Publishing FAIR research outputs
  - Interactive dashboards with R Shiny
  - Literate programming with R Markdown
  - Data wrangling with dplyr and tidyr
  - Data visualisation with ggplot



## browseMetadata

all contributors 1

lifecycle: experimental

DOI: [10.5281/zenodo.10991500](https://doi.org/10.5281/zenodo.10991500)

This R package was created to help a researcher browse the health datasets in [SAIL databank](#). It has scope to be applied to other health datasets. It is intended to be useful in the earlier stages of a project. When a research team has not yet got access to the data they can still browse the metadata, and address such questions as:

- ? what datasets are available?
- ? what datasets do I need for my research question?
- ? which variables within these datasets map onto my research domains of interest? (e.g. socioeconomic factors, childhood adverse events, medical diagnoses, culture and community)

There are many existing tools that allow you to browse metadata for health datasets, read more [here](#).

### What is the browseMetadata package?

This R package is a planning tool, designed to be used alongside other tools and sources of information about health datasets for research. For many health datasets, including SAIL, the metadata is publicly available. This R package uses the [Health Data Research Gateway](#) and the connected [Metadata Catalogue](#). This R package takes a metadata file as input and facilitates the process of browsing through each table within a chosen dataset. The user is asked to categorise each data element (variable) within a table into a domain related to their research question, and these categorisations get saved in a csv file for later reference. To speed up this process, the function automatically categorises some variables that regularly appear in health datasets (e.g. ID, Sex, Age).

**⚠** This package is in early development, and has only been tested on a limited number of metadata files. In theory, this package should work for any dataset listed on the Health Data Research Gateway (not just SAIL) as long as a json metadata file can be downloaded. In practice, it has only been tested on a limited number of metadata files for SAIL databank.

### License

[Full license](#)

GPL (>= 3)

### Community

[Contributing guide](#)

### Citation

[Citing browseMetadata](#)

### Developers

[Rachael Stickland](#)

Author, maintainer 

- A tool to map research domains of interest to corresponding variables within the SAIL databank.
- Inspired by the work carried out by Data Wranglers with MELD-B.
- Open source R package.
- Designed to be compatible with any dataset listed on the Health Data Research Gateway, provided a JSON metadata file is available.

README CC-BY-4.0 license

# AI-MLTC Drug Lists

all contributors

DOI: 10.5281/zenodo.10992603

License: CC BY 4.0

This repository has been setup to share drug lists across NIHR's AIM projects. Currently, the drug lists come from the AIM Consortium OPTIMAL, based in Birmingham. You can find all the drug lists created by OPTIMAL in this repository.

## About the lists

There is variation in how different systems approach the classification and mapping of various drugs, and it has been noted that there is a lack of single data consistency.


The drug lists have been created using different methods to find a more efficient process to integrate as part of the Code Builder tool:

- Method 1:** Involved manually curating a list of generic drug names on the BNF, and searching for respective brand names on the dm+d browser
- Method 2:** Involves the use of both the [snomedizer](#) R package and a dm+d tool implementation (downloading latest dm+d distribution from NHS [Technology Reference Update Distribution TRUD webpage](#)). It's in the pipeline to create a self-contained wrapper for this process.
  - this method is a substance-based approach and involves running through a list of IDs for medicinal products.


The process for the creation of the lists can be found in the [generation-process folder](#) and the drug lists themselves in the [drug-lists folder](#).

## Contributors


Thanks goes to these wonderful people ([emoji key](#)):



Jenny Cooper



Mahwish M



Tirini Zompa

This project follows the [all-contributors](#) specification. Specifically, [✍ content](#) refers to creation of drug lists, [📖 documentation](#) refers to the documentation created in this repository, and [👁 feedback](#) refers to clinical auditing of the lists.

- In collaboration with the OPTIMAL team
- To date, 15 code lists generated and filtered by the RSF data wranglers, and quality checked by OPTIMAL's clinical team.
- Openly available under CC-BY license

Files

main

Go to file

- drug-lists
  - Anticonvulsants
  - Antipsychotics
  - Benzodiazepines
  - Dementia\_Drugs
  - Galantamine
  - Lithium
  - Metformin
  - Mirtazapine
  - Monocamine\_Oxidase\_Inhibitor
  - Rivastigmine
  - SNRIs
  - SSRIs
  - Strong\_Opioids
  - Thyroid\_Antidepressants
  - Weak\_Opioids
  - README.md
- generation-process
  - all-contributorsrc
  - .gitignore
  - LICENCE
  - README.md
  - drug-lists.Rproj

drug-lists / drug-lists /

README.md

### About

This folder contains the drug lists themselves

### Folder and file structure

The lists for each drug are contained within a single folder, named after the category of drug, e.g. Benzodiazepines. Within the folder, there are the following files:

- the drug codes for that medication as found in the [CEGEDIM data](#)
- the drug codes for that medication as found in [CPRD AURUM](#), the Clinical Practice Research Datalink, using EMIS clinical systems
- the drug codes for that medication as found in [CPRD GOLD](#), the Clinical Practice Research Datalink, using InPS Vision clinical systems
- the drug codes for that medication as found in [IMRD](#), the Iqvia Medical Research Data
- the drug codes for that medication as found in [UHB](#), the University Hospitals Birmingham data.

Each file contains the following columns (this information is copied from the [CodeBuilder documentation](#) written by Krishna Gokhale)

- Drug\_code Id**: the actual term stored in the drug database that represents the code you are looking for, this might be a number, a short string, or a hexadecimal value
- Description**: the text description of the drug code, this will also include (where available) the drug substance, strength, route of administration etc.
- BNF1, BNF2, BNF3**: The [British National Formulary \(BNF\)](#) codes from this pseudo-classification are used in the prescribing dataset as a unique identifier to show what was prescribed.
- ATC**: the code for this drug in the [Anatomical Therapeutic Chemical Classification System \(ATC\)](#). The ATC is a drug classification system that classifies the active ingredients of drugs according to the organ or system on which they act and their therapeutic, pharmacological, and chemical properties.
- Database**: the database to which this information applies

# World-leading, collaborative researchers working to improve the lives of people with MLTC



**The Good, the Bad and the Public**  
Tuesday 13 Aug 2024  
Time: 13.30 - 14.30

Anica Alvarez Nishio



**Data-Centric AI**  
Tuesday 14 May 2024  
Time: 13.30 - 14.30

Prof. Paolo Missier



**AI-based modelling of EHRs of patients with learning disabilities and multiple long-term health conditions**  
Tuesday 09 Apr 2024  
Time: 13.30 - 14.30

Professor Georgina Cosma | Dr. Rania Kousousta  
| Dr. Emeka Abakasanga



**How DataLoch Can Be Utilised for Researchers Studying Multi-Long-Term Conditions**  
Tuesday 08 Aug 2023  
Time: 13.30 - 14.30

Kathy Harrison



**How to Deal with Privacy, Bias & Drift in Synthetic Primary Care Data**  
Tuesday 11 Jul 2023  
Time: 13.30 - 14.30

Allan Tucker



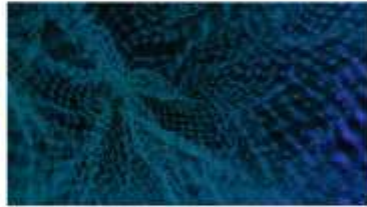
**The potential for AI to help with better prescribing and medicines optimisation**  
Tuesday 13 Jun 2023  
Time: 13.30 - 14.30

Dr. Anthony J Avery OBE



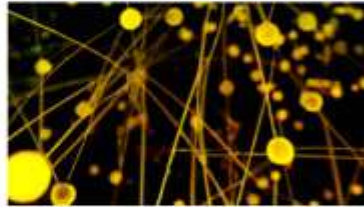
**Multimorbidity and place**  
Thursday 14 Mar 2024  
Time: 11.00 - 12.00

Alan Marshall



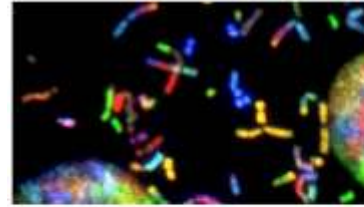
**Dynamic Artificial Intelligence (DynAIRx)**  
Tuesday 13 Feb 2024  
Time: 13.30 - 14.30

Dr. Aseel Abuzour



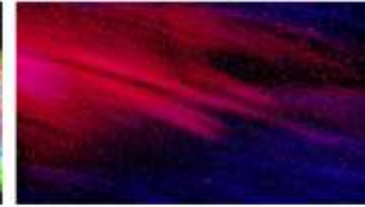
**Translating "Practice into Evidence"**  
Tuesday 09 Jan 2024  
Time: 13.30 - 14.30

Deborah Swinglehurst



**Public engagement: Data for science and health**  
Tuesday 09 May 2023  
Time: 13.30 - 14.30

Emily Jesper-Mir



**Structured missing data: Grand challenges in learning from multi-modal data at scale**  
Tuesday 14 Mar 2023  
Time: 13.30 - 14.30

Robin Mitra | Sarah McGough



**RSF seminar series: Using routinely collected electronic healthcare record data to study respiratory disease**  
Tuesday 14 Feb 2023  
Time: 13.30 - 14.30

Jennifer Quint



**Drawing straight lines along blurred boundaries**  
Tuesday 14 Nov 2023  
Time: 13.30 - 14.30

Louise Locock



**Fairness: The cascading effects in medical devices**  
Tuesday 10 Oct 2023  
Time: 13.30 - 14.30

Claudia Fischer | Smrera Jayadeva



**The SAIL Databank research project journey**  
Tuesday 26 Sep 2023  
Time: 13.30 - 14.30

Ian Farr | Sarah Rees



**RSF seminar series: Developing and publishing code for trusted research environments**  
Tuesday 08 Nov 2022  
Time: 13.30 - 14.30

Ed Chalstreay



**RSF seminar series: DEXtER, a semi-automated epidemiology platform for electronic health record research**  
Tuesday 11 Oct 2022  
Time: 13.30 - 14.30

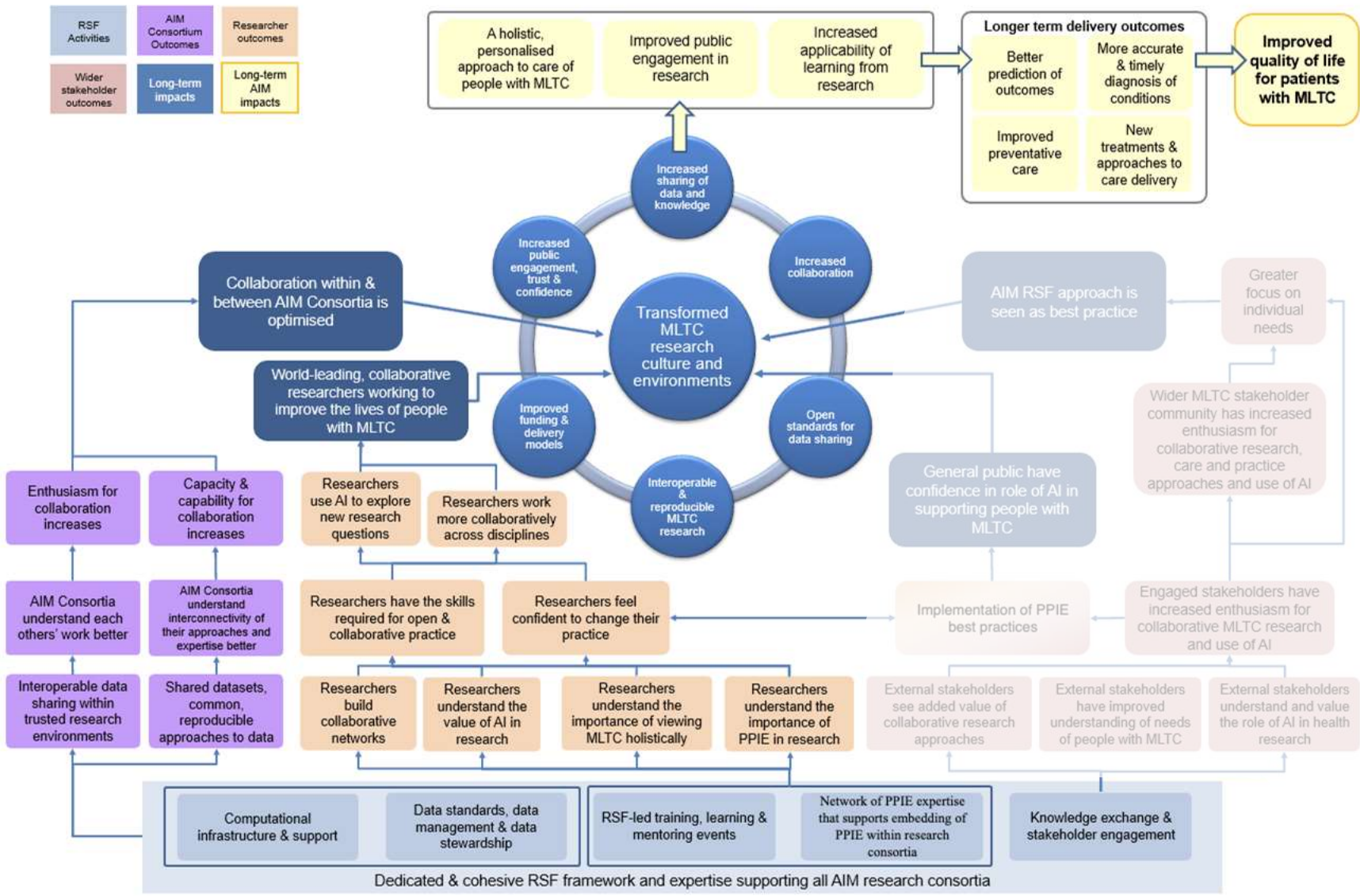
Utsav Nandhakumar



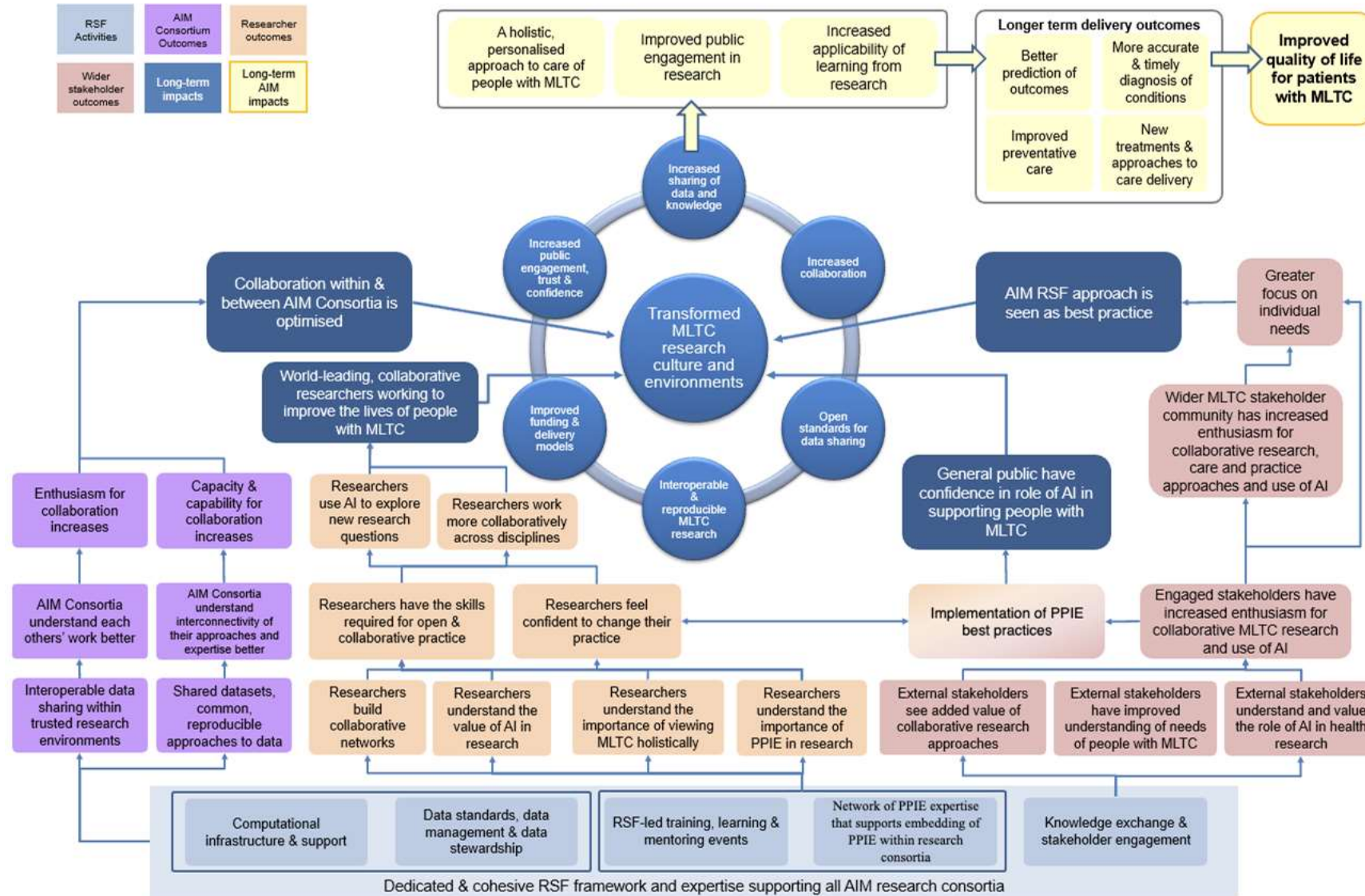
**RSF seminar series: Everyone has a say**  
Tuesday 13 Sep 2022  
Time: 13.30 - 14.30

Meag Doherty

# AIM RSF Theory of Change



# AIM RSF Theory of Change



# General public have confidence in role of AI in supporting people with MLTC

- Co-hosting and facilitating meetings of the MLTC Community of Practice led by Stephanie Hanley
- Workshops on “What is Data?” and “What is AI?” alongside broader discussions, including recent input to the design of our annual conference.

*“I have thoroughly enjoyed being part [of CoP], I am patient voice rather than early career researcher. So, I see my role as more to reassure early career researchers we are not scary and can help them do things better” - Amanda, expert by lived experience.*

*“The advantage of this community is that it is a big PPI group and meetings are well attended including several members of the research team. It is now a well-developed group which bodes well for the future” - Margaret, expert by lived experience.*



“

*The Turing Way* is an **open source book project** that involves and supports a **diverse research community** in ensuring that reproducible and ethical **data science** is accessible and comprehensible **for everyone.**

”

@TuringWay @kirstie\_j

<https://doi.org/10.5281/zenodo.10992603>





[READY FOR REVIEW] PPIE version of Inclusive Events chapter #3550

0 / 16 files viewed Review in codepage Review changes

Filter changed files

- github/workflows
  - ci.yml
- book/website
  - \_bibliography
    - references.bib
    - \_toc.yml
  - afterword
    - glossary.md
  - collaboration
    - hybrid-collab
      - hybrid-collab-guidelines.md
      - inclusive-events.md
      - organising-conference.md
      - ppie-events.md
    - ppie-events
      - ppie-events-checklist.md
      - ppie-events-comms.md
      - ppie-events-location.md
      - ppie-events-planning.md
      - ppie-events-resources.md
      - ppie-events-schedules.md
      - ppie-events-socials.md
      - ppie-events-tech.md

15 book/website/collaboration/organising-conference.md

287	- If possible, provide a grant to buy necessary equipment such as headphones, webcams, and/or high-speed internet.	288	- If possible, provide a grant to buy necessary equipment such as headphones, webcams, and/or high-speed internet.
288	- Share the participation guidelines, code of conduct and contact information of people who can help with any issues regarding the meeting.	218	- Share the participation guidelines, code of conduct and contact information of people who can help with any issues regarding the meeting.
289	- Send a reminder with the links to the document(s) and other important resources to all the participants a week and a day in advance.	211	- Send a reminder with the links to the document(s) and other important resources to all the participants a week and a day in advance.
218	- Create slides or presentations that might be needed from the <b>organisers</b> side (welcome, wrap up).	212	- Create slides or presentations that might be needed from the <b>organiser's</b> side (welcome, wrap up).
211		213	
212	<b>### Organise a pre-event community call</b>	214	<b>### Organise a pre-event community call</b>
213	*Often referred to by different names such as installation party, coffee-hours or set-up test fest*	215	*Often referred to by different names such as installation party, coffee-hours or set-up test fest*
250,7 +250,7	<b>## Provide plenty of breaks, and treat those breaks as virtual coffee sessions.*</b>		
254	- Plan the seating arrangement so that people are facing to the main screen/camera.	258	- Plan the seating arrangement so that people are facing to the main screen/camera.
257	- Test the screen with different light intensity.	259	- Test the screen with different light intensity.
258	- Arrange all the required materials and equipment, like extension cords or power strips.	260	- Arrange all the required materials and equipment, like extension cords or power strips.
259	- Create a form to collect dietary requirements, interest in participating in a social event, mobility-related <b>requirements</b> and other location-specific requests.	261	- Create a form to collect dietary requirements, interest in participating in a social event, mobility-related <b>requirements</b> and other location-specific requests.
268	- Arrange for beverages/snacks for the breaks, and ensure that the catering service will label the food for contents/allergens.	262	- Arrange for beverages/snacks for the breaks, and ensure that the catering service will label the food for contents/allergens.
261	- If organising any location-specific social event, run that in parallel to the remote social event.	263	- If organising any location-specific social event, run that in parallel to the remote social event.
262	- Book social event venue, transfer, and catering and communicate them clearly.	264	- Book social event venue, transfer, and catering and communicate them clearly.
270,7 +270,7	<b>## Provide plenty of breaks, and treat those breaks as virtual coffee sessions.*</b>		
278		272	
273	- Start the video call, or any communication channel 30 minutes before the event to check that everything works.	273	- Start the video call, or any communication channel 30 minutes before the event to check that everything works.
272	- Share links to the documents and other resources for the event on the chat system like Slack.	274	- Share links to the documents and other resources for the event on the chat system like Slack.
273	- Remind attendees of the community participation <b>guideline</b> and the Code of Conduct.	275	- Remind attendees of the community participation <b>guidelines</b> and the Code of Conduct.
274	- Introduce the organising committees and the Code of Conduct contact person for the event.	276	- Introduce the organising committees and the Code of Conduct contact person for the event.
275	- Introduce the format of the meeting and when the breaks are scheduled.	277	- Introduce the format of the meeting and when the breaks are scheduled.
276	- Explain the basic protocols for participation.	278	- Explain the basic protocols for participation.
291,8 +291,8	<b>## Provide plenty of breaks, and treat those breaks as virtual coffee sessions.*</b>		
293	{(l-organising-conferences-after)=	295	{(c)-organising-conferences-after)=
294	<b>## After the event</b>	296	<b>## After the event</b>
295		297	
296	- Create a debrief document to capture what went well and what could be improved in future events.	298	- Consider how you will ensure that everyone is able to access return transport safely if your conference is hosted in-person or hybrid.
297	- Create a small overview blog post to share the main highlights from the event with community/participants immediately.	299	- Create a debrief document to capture what went well and what could be improved in future events.
298	- Collect any additional documents or information mentioned by others/speakers during the events.	300	- Create a small overview blog post to share the main highlights from the event with the community/participants immediately.
299	- If the event sessions and talks were recorded, process and publish the recorded videos within a defined time frame.	301	- Collect any additional documents or information mentioned by others/speakers during the events.
300	- Send thank you emails to everyone with the link of the complete notes and all the relevant information.	302	- If the event sessions and talks were recorded, process and publish the recorded videos within a defined time frame.
		303	- Send thank you emails to everyone with the link of the complete notes and all the relevant information.

16 book/website/collaboration/ppie-events.md

BrainonSilicon 2 weeks ago Member Author

Great suggestions and changes!

I've made the typo and line edits, and also shifted the language to focus "involvement" so that it aligns well with the goals of PPIE.

Reply...

Resolve conversation

<https://github.com/the-turing-way/the-turing-way/pull/3550>

<https://the-turing-way.netlify.app/index.html>

<https://github.com/the-turing-way/the-turing-way>

<https://doi.org/10.5281/zenodo.10992603>

[READY FOR REVIEW] PPIE version of Inclusive Events chapter #3550

0 / 16 files viewed Review in codespace Review changes

Filter changed files

- .github/workflows
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- book/website
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    - references.bib
    - \_toc.yml
  - afterword
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  - collaboration
  - hybrid-collab
    - hybrid-collab-guidelines.md
    - inclusive-events.md
    - organising-conference.md
    - ppie-events.md
  - ppie-events
    - ppie-events-checklist.md
    - ppie-events-comms.md
    - ppie-events-location.md
    - ppie-events-planning.md
    - ppie-events-resources.md
    - ppie-events-schedules.md
    - ppie-events-socials.md
    - ppie-events-tech.md

60 book/website/collaboration/ppie-events.md

by it, and to improve the quality of research by including lived knowledge and perspectives.

46 + As part of this involvement and engagement, researchers and research staff will need to plan events that are inclusive and accessible for people with lived experience, and delivered in a way that avoids presenting barriers to people with lived experience taking part equitably.

47 +

48 + "Lived experience" can be a range of things such as a disability, long-term health condition, bereavement, having worked in a specific profession, or the lived experience of caring responsibilities.

aleesteele last week Member

Suggested change

48 - "Lived experience" can be a range of things such as a disability, long-term health condition, bereavement, having worked in a specific profession, or the lived experience of caring responsibilities.

48 + "Lived experience" as it is used within the research context can be a range of things such as a disability, long-term health condition, bereavement, having worked in a specific profession, or the lived experience of caring responsibilities.

Commit suggestion Add suggestion to batch

Adding a gentle suggestion here for some qualifying language. Should this be added to the glossary?

BrainonSilicon last week Member Author

Good suggestion! I think it would be a good idea to enter even a basic definition in.

Do you think this sentence should also reference how the phrase lived experience is used/means within a policy, social and health care settings too? Or do we need to narrow it down to just be relevant to the research experience?

Reply...

Resolve conversation

49 + In the context of event planning, there are practices we can use to foster participation of this diverse group of people.

<https://github.com/the-turing-way/the-turing-way/pull/3550>

<https://the-turing-way.netlify.app/index.html>

<https://github.com/the-turing-way/the-turing-way>

<https://doi.org/10.5281/zenodo.10992603>

# AIM RSF approach is seen as best practise

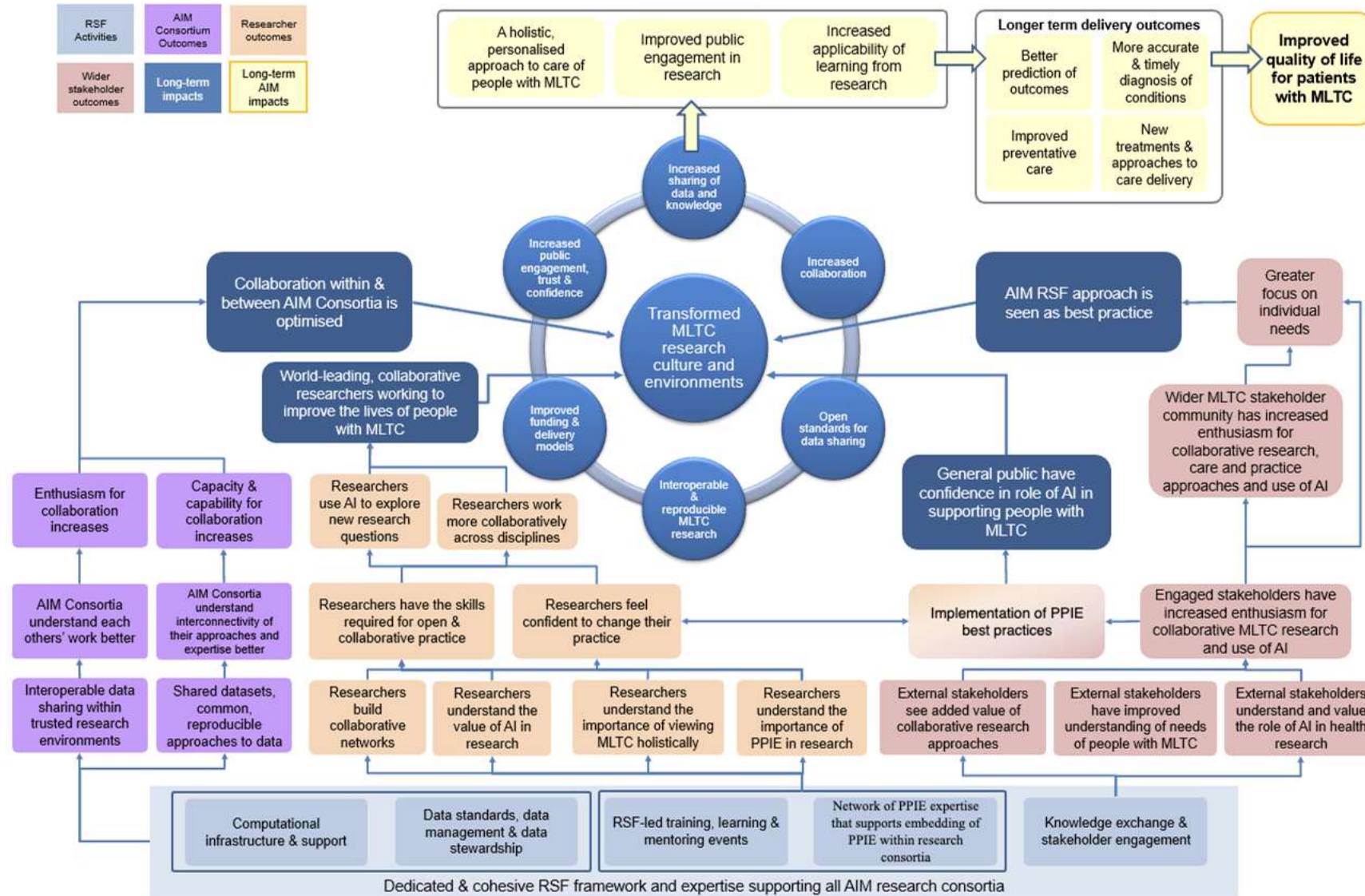
*“As a PI, if the RSF isn’t there, it becomes my job to do all this and this becomes an extra burden of work for me. This work may or may not happen, and could delay best practice in this area.” Rafael Perera-Salazar, COMPUTE PI*

*“Capturing what all the consortia have done in a rigorous way including the problems they’ve faced is something the consortia would never do themselves” Bruce Guthrie, AIM CISC PI.*

- Engage with stakeholders across the ecosystem.
  - Recent presentations at Turing’s AIUK conference.
- Demonstrate a commitment to openness and trustworthy research and innovation.
- Regular connections with NIHR Programme management.



# AIM RSF Theory of Change



# AI for Multiple Long Term Conditions

- [AIM-CISC](#): Analyse and understand which patterns of multimorbidity are most common, which most affect people's lives, and help improve the quality and safety of care.
  - University of Edinburgh, The Roslin Institute, NHS Lothian, and University College London.
- [AI-MULTIPLY](#): Characterise the dynamic relationships of MLTC and polypharmacy and inform healthcare pathways.
  - University of Newcastle and Queen Mary University.
- [Cluster-AIM](#): Develop and validate population clusters to integrate health and social care using mixed methods.
  - Southampton, Oxford, Kent, Nottingham and Leicester.
- [DECODE](#): Mapping the challenges and requirements for Data-driven, machine learning-aided stratification and management of multiple long-term Conditions in adults with intellectual Disabilities (ID).
  - Leicestershire NHS Trust, Loughborough University, University of Leicester, and De Montfort University.
- [DynAIRx](#): Develop new, easy-to-use AI and data visualisation tools that help GPs and pharmacists treat patients with MLTC.
  - Liverpool, Leeds, Manchester and Glasgow.
- [MELD-B](#): Identify life-course time points and targets for the prevention of early-onset, burdensome Multiple Long-Term Conditions.
  - University of Southampton, University of Glasgow, Swansea University, Southampton City Council, University of Aberdeen, and King's College London.
- [OPTIMAL](#): OPTIMising therapies, discovering therapeutic targets and AI-assisted clinical management for patients living with complex multiple long-term conditions.
  - University of Birmingham, University of Manchester, University Hospitals Birmingham NHS Trust, NHS Greater Glasgow & Clyde, and University of St Andrews.



Theme 1: Reproducible and interoperable infrastructure

Theme 2: Research-ready data



The Alan Turing Institute



THE UNIVERSITY of EDINBURGH



Theme 3: Community building and training

Theme 4: Public and patient involvement and engagement

Programme management



Theme 5: Sustainability and legacy



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