

Reducing illegal drug deaths- examples of use of innovative technology and systems thinking

Profs Dr Alexander Baldacchino
ISAM Immediate Past President, EUDA Scientific Advisor
and Chair WPA Addiction Psychiatry Section
Professor of Medicine, Psychiatry and Addiction
St Andrews University, UK

10-12th June 2025
Albatros International Congress, Paris



'I have no actual or potential conflicts of interest to disclose.'



World Health Organization

Specialized health agency of the UN system: WHO's mission is to promote health, keep the world safe, and serve the vulnerable. Access to affordable and adequate health care is a human right and universal healthcare is a key principle guiding WHO's work.

Six Regional offices + HQ

150+ country offices



A Global Health Strategy for 2025–2028

advancing equity and resilience in a turbulent world

Fourteenth General Programme of Work



A photograph of several young children, likely of Southeast Asian descent, smiling and laughing in a dusty, outdoor environment. The child in the foreground is a girl with dark hair, wearing a red tank top, and is reaching out towards the camera. Other children are visible in the background, some also smiling. The overall mood is joyful and hopeful.

WHO Innovation Hub



**World Health
Organization**

The vision of the WHO Innovation Hub is a world where innovation drives health equity, accessibility, and positive health outcomes

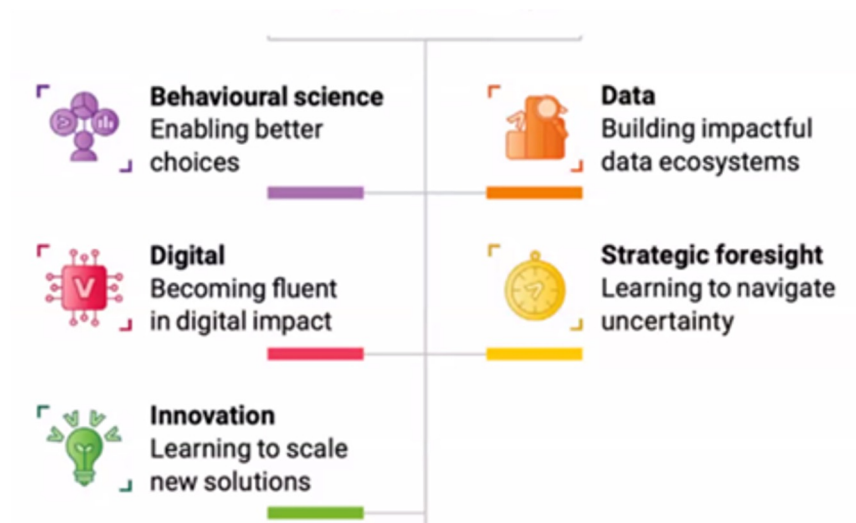
Considerations around innovation and the common good

- Redesigning the health innovation ecosystem for the common good requires a major shift from a model where innovation is seen as being driven by market forces, to a model that is collectively governed in the public interest.
- While public and academic research typically focus on high-risk areas of research, industry will only invest in the commercialization of the most financially interesting projects.
- Diseases relevant to high-income countries are seven to eight times more likely to be investigated than those that mainly affect low- and middle-income countries



UN 2.0 vision towards 2030

To harness cutting-edge skills to deliver better results in line with UN mandates

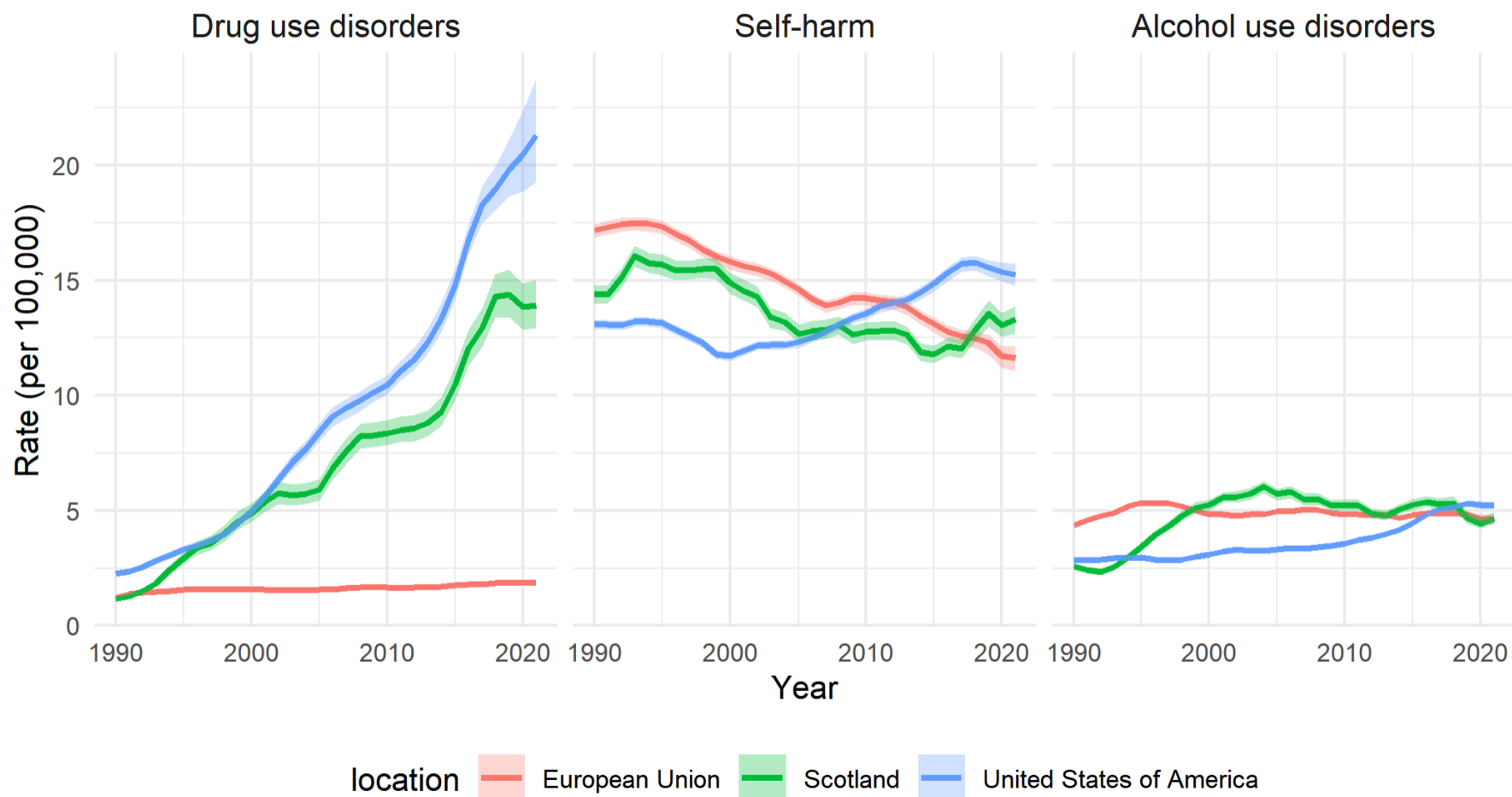


“UN 2.0 is about strengthening our expertise and culture – to build a UN system that can better support Member States in the 21st century.”



Problem

Age-standardised mortality rate by Cause and Region/Country



Source: Global Burden of Disease (2025)

Drug deaths in Scotland



More than one drug found to be present in the body in **93%** of drug misuse deaths in 2021 (2020: 93%)



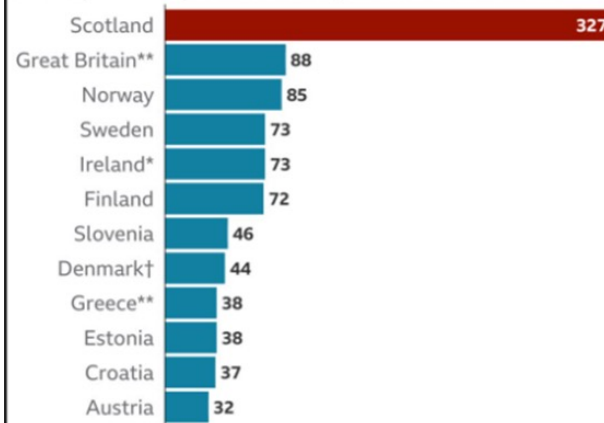
Opiates/opioids present in **84%** (1,119) of drug misuse deaths (2020: 89%, 1,192 deaths)



Benzodiazepines present in **69%** (918) of drug misuse deaths (2020: 73%, 974 deaths)

More drug deaths per capita in Scotland than other European countries

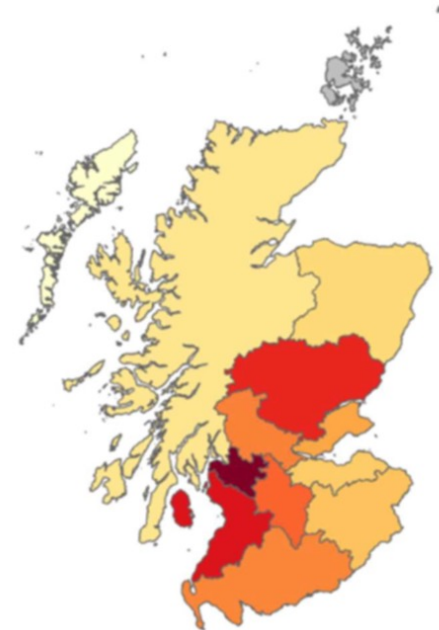
Deaths per million aged 15-64 in Scotland, Great Britain and top 10 European countries, latest available data

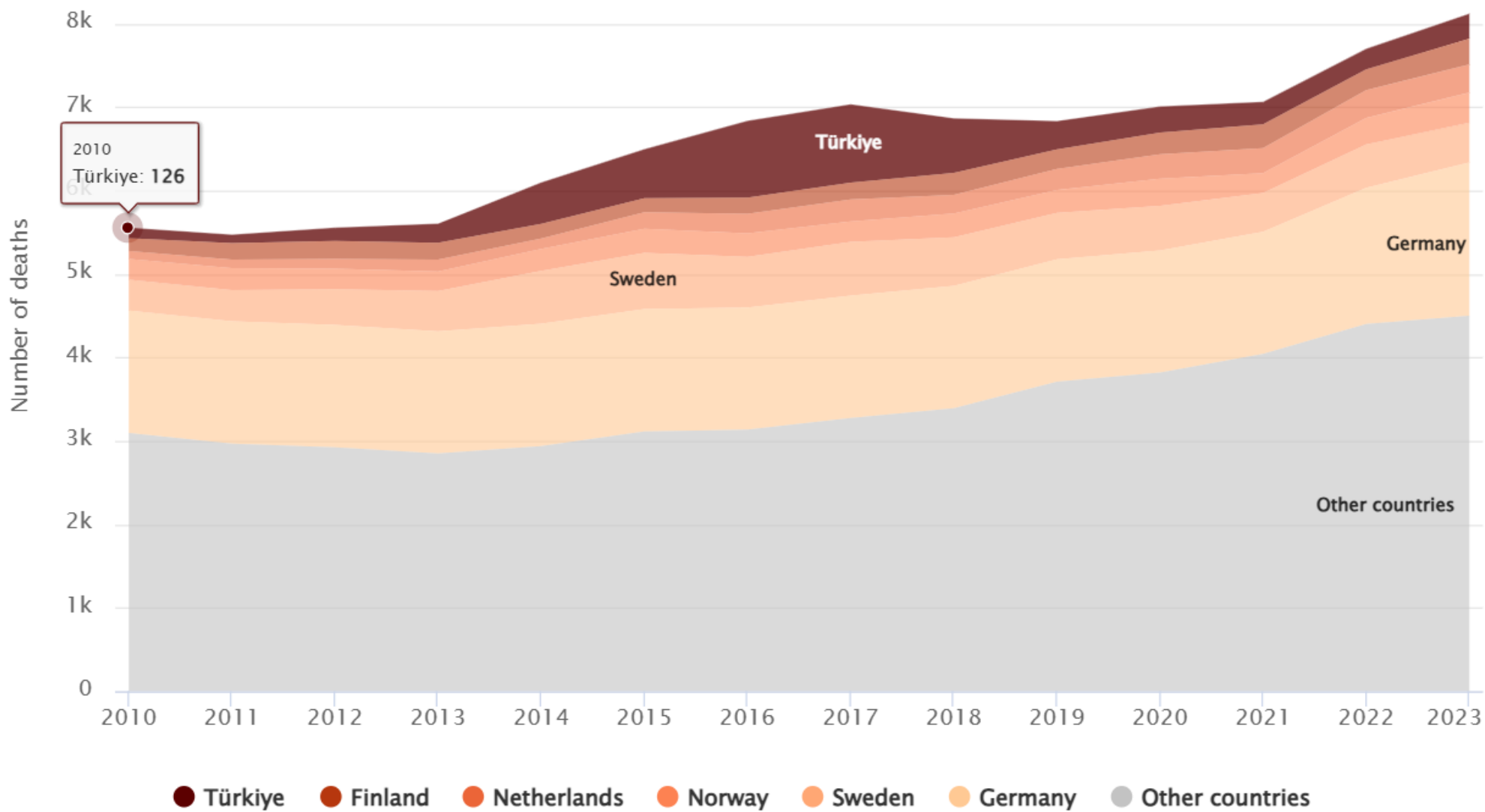


Note: All data to 2020 unless marked. *Data to 2017, **Data to 2018, †Data to 2019

Source: EMCDDA, National Records of Scotland

BBC





Reducing fatal outcomes if overdose occurs

Naloxone administration

Naloxone distribution and training
Specialist services and first responders, community

Drug consumption facilities

Fatal overdose prevention apps

Reducing the risk of overdose occurring

Opioid agonist treatment, retention and continuity of care

Targeted interventions at times of reduced tolerance
e.g. release from prison or interrupted treatment

Overdose risk assessment, awareness raising and harm reduction

Overdose prevention strategies

Prevention of diversion of medicines

Drug checking and public health alerts

Supporting transition from injecting to smoking opioids

Targeted treatments
Naltrexone treatment
Heroin-assisted treatment

Reducing vulnerability

Integrated care with mental health and generic health services

Interventions to improve access to social and health care

Housing programmes

Support to employment programmes

Interventions to reduce/prevent stigma

Potential fields of innovation in treatment of addiction

- Digital Health and Telemedicine (apps for recovery and wearable technology)
- Pharmacological and Pharmaceutical (Long-acting)
- Biotechnology and Neuroscience (Neurostimulation)
- Behavioural and Psychosocial (CBT integrated with AI)
- Virtual Reality and Augmented Reality
- Blockchain for patient data
- Behavioural economics and cryptocurrency-based rewards
- Digitalised integrated care models
- Delivery systems (drones)

Objectives

1. Innovative services
2. Innovative data collection
3. Innovative technology

Innovation gaps: what the community sees and why lived experience matters.

- Lack of access to evidence-based treatments
- Regulatory hurdles, stigma, and political resistance
- Innovations not reaching the most vulnerable
- Digital tech not designed with/for people who use drugs

Innovation is more than molecules—it is systems, access, and equity

Innovation without equity is failure



Priority Setting Partnership in Addiction – The Top 10 questions

1

What are the best approaches to reducing drug related deaths?

2

What are the best ways to treat **trauma** alongside treatment for addiction to drugs and/or alcohol?

3

How can **stigma and discrimination** against people with addiction to drugs and/or alcohol be addressed within health services to improve care?

4

What are the best approaches to **harm reduction** for people with addiction to drugs and/or alcohol (e.g. providing safe community spaces to inject)?

5

What are the best ways to **treat** people with addiction to drugs and/or alcohol and a **mental health** problem?

6

What are the best ways to **support children** affected by people with addiction to drugs and/or alcohol?

7

How can treatment for addiction to drugs and/or alcohol be **tailored to the needs of each individual**, for example reflecting their **cultural background**?

8

How can addiction services and mental health services work better together to improve outcomes for people who have a mental health condition and addiction to drugs and/or alcohol?

9

What are the best psychological therapies for people with addiction to drugs and/or alcohol?

10

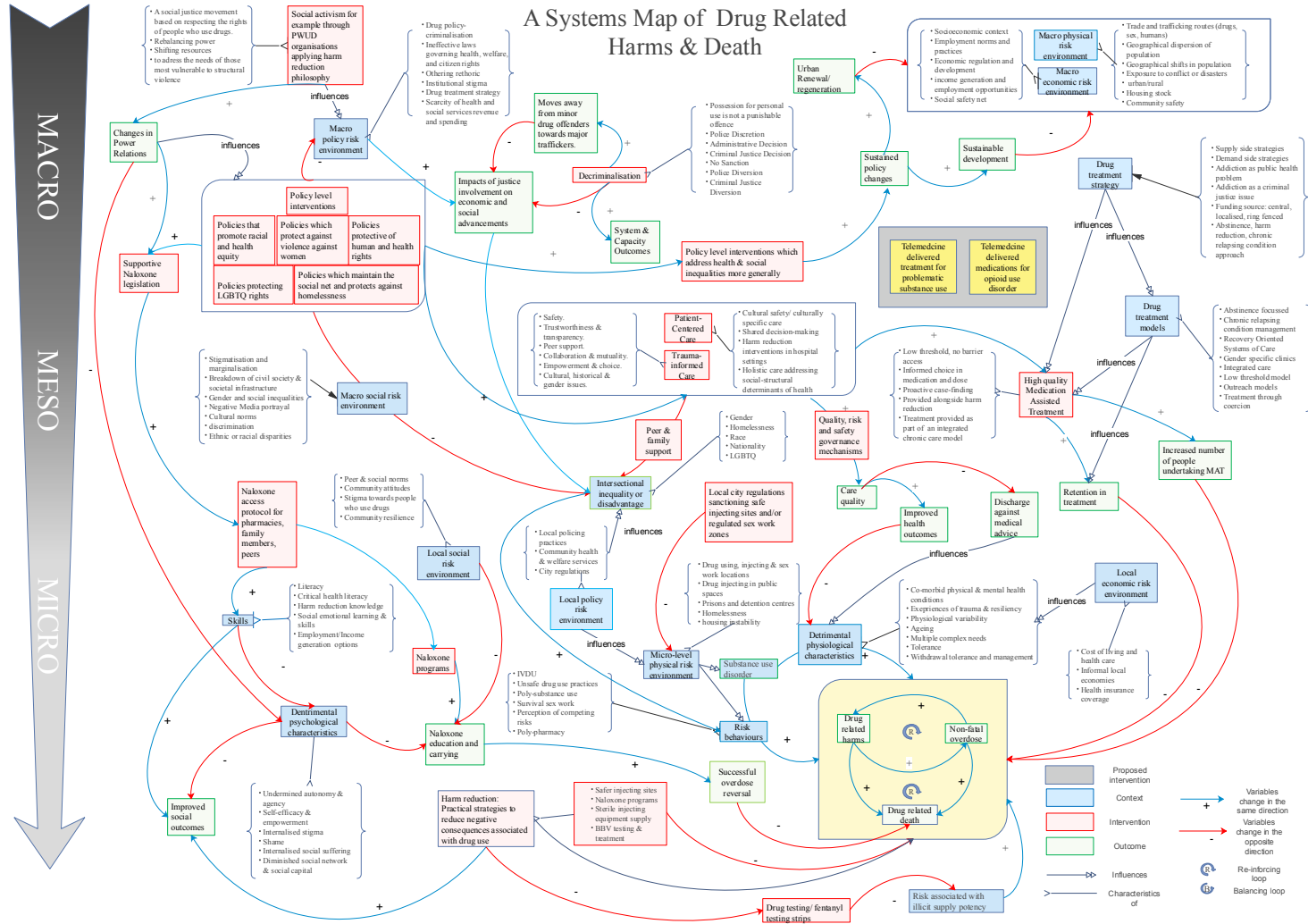
What are the best ways to prevent a relapse during recovery for addiction to drugs and/or alcohol?

1. Systems and implementation science: innovative services

Why Addiction Medicine Is Uniquely Challenging

Stigma	<ul style="list-style-type: none">• Limits investment and adoption
Fragmented care systems	<ul style="list-style-type: none">• Lack of standardization in management and practices
Reimbursement complexity	<ul style="list-style-type: none">• Approval ≠ access; constantly evolving policies
Social Determinants of Health	<ul style="list-style-type: none">• Complexity makes it hard to solve SUD
Asymmetrical Innovation	<ul style="list-style-type: none">• Rapid Innovation on the wrong side: more powerful substances

A Systems Map of Drug Related Harms & Death



Vital parameters

- Inclusion health focus
- Transitions through care
- Complexity of care needs
- Increasing service resilience
- Information and data
- Multiagency
- Digitally enabled workforce
- Stigma reduction



Understanding the use of telemedicine across different Opioid Use Disorder (OUD) treatment models: A scoping review.

Journal:	<i>Journal of Telemedicine and Telecare</i>
Manuscript ID	JTT-23-05-049.R1
Manuscript Type:	Research
Date Submitted by the Author:	n/a
Complete List of Authors:	Tay Wee Teck, Joseph; University of St Andrews, School of medicine; Humankind, Forward Leeds Butner, Jenna; Yale School of Medicine, Department of Internal Medicine Baldacchino, Alexander; University of St Andrews, School of medicine
Keyword:	Telemedicine, Medication for Opioid Use Disorder, Digital divide, Opioid Use Disorder, COVID-19

SCHOLARONE™
Manuscripts



Oxford Open Digital Health, 2022, 1–9

<https://doi.org/10.1093/oodh/oqac002>

Research Article

The Telemedicine Program Design Canvas: a visual tool for planning telemedicine interventions

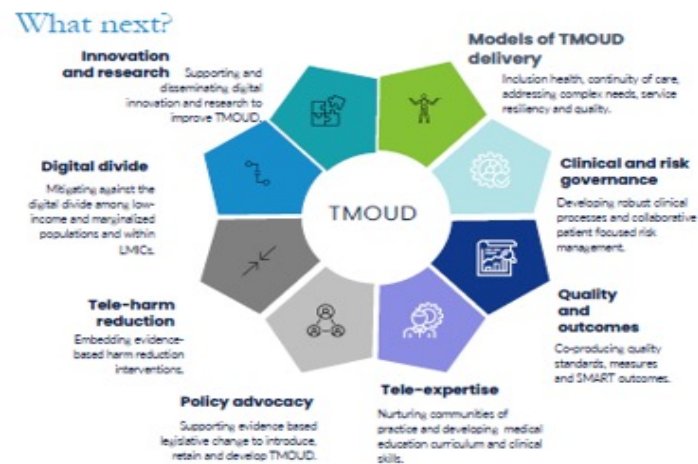
Neha Verma¹, Izabella Samuel², Samuel Weinreb¹, Mackenzie Hall², Kai Zhang², Mariana Bendavid², Vibha Bhirud³, Jordan Shuff², Youseph Yazdi² and Soumyadip Acharya²

¹Division of Biomedical Informatics & Data Science, Johns Hopkins University School of Medicine, Baltimore, MD, USA

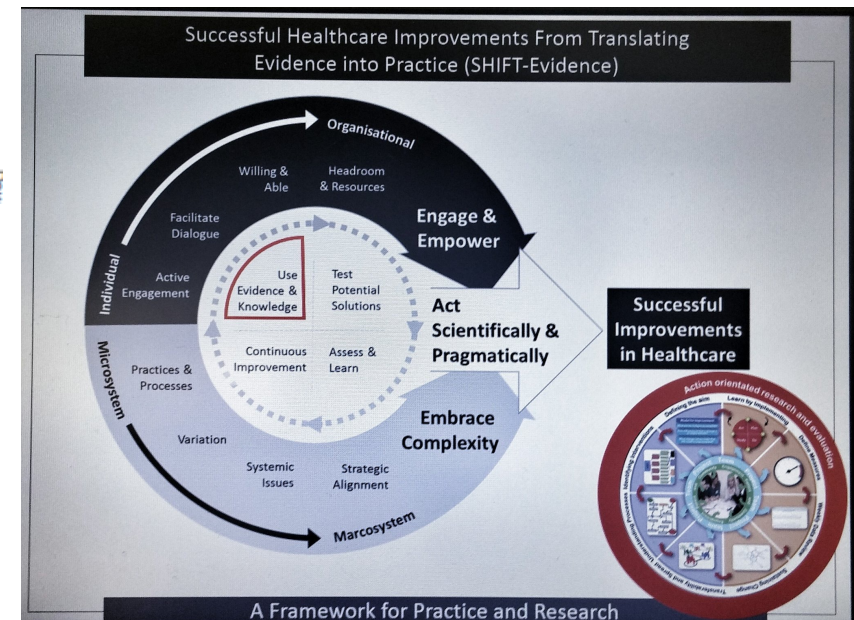


Models of care surrounding the use of telemedicine to provide medication for opioid use disorder.

Authors: Joseph Tay (joseph.tay@uct.ac.za), Jenna Butler, Alex Baldacchino



LOW





Key implementation factors in telemedicine-delivered medications for opioid use disorder: a scoping review informed by normalisation process theory

Joseph Tay Wee Teck, Giedre Zlatkute, Alberto Perez, Heidi Dritschel, Abhishek Ghosh, Marc N Potenza, Atul Ambekar, Hamed Ekhtiari, Dan Stein, Yasser Khazaal, Shalini Arunogiri, Marta Torrens, Marica Ferri, Susanna Galea-Singer, Alex Baldacchino

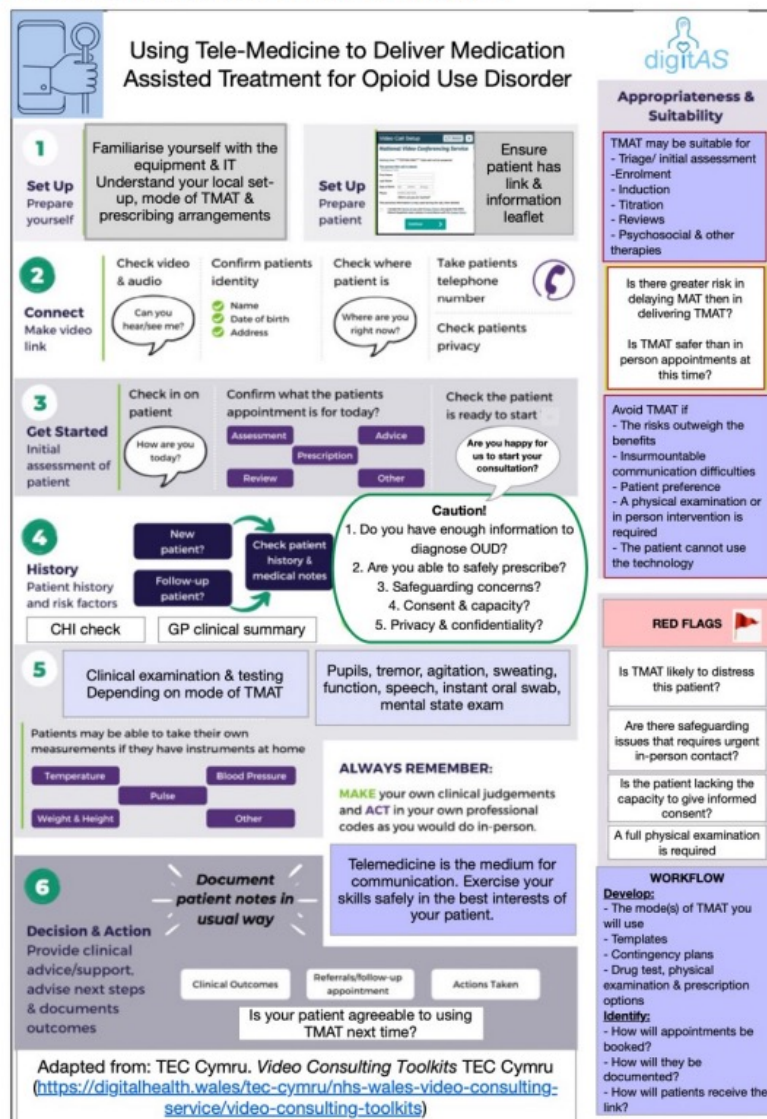
Lancet Psychiatry 2023;
10: 50–64

DigitAS Project, Population
and Behavioural Science,
School of Medicine, University
of St Andrews, St Andrews, UK

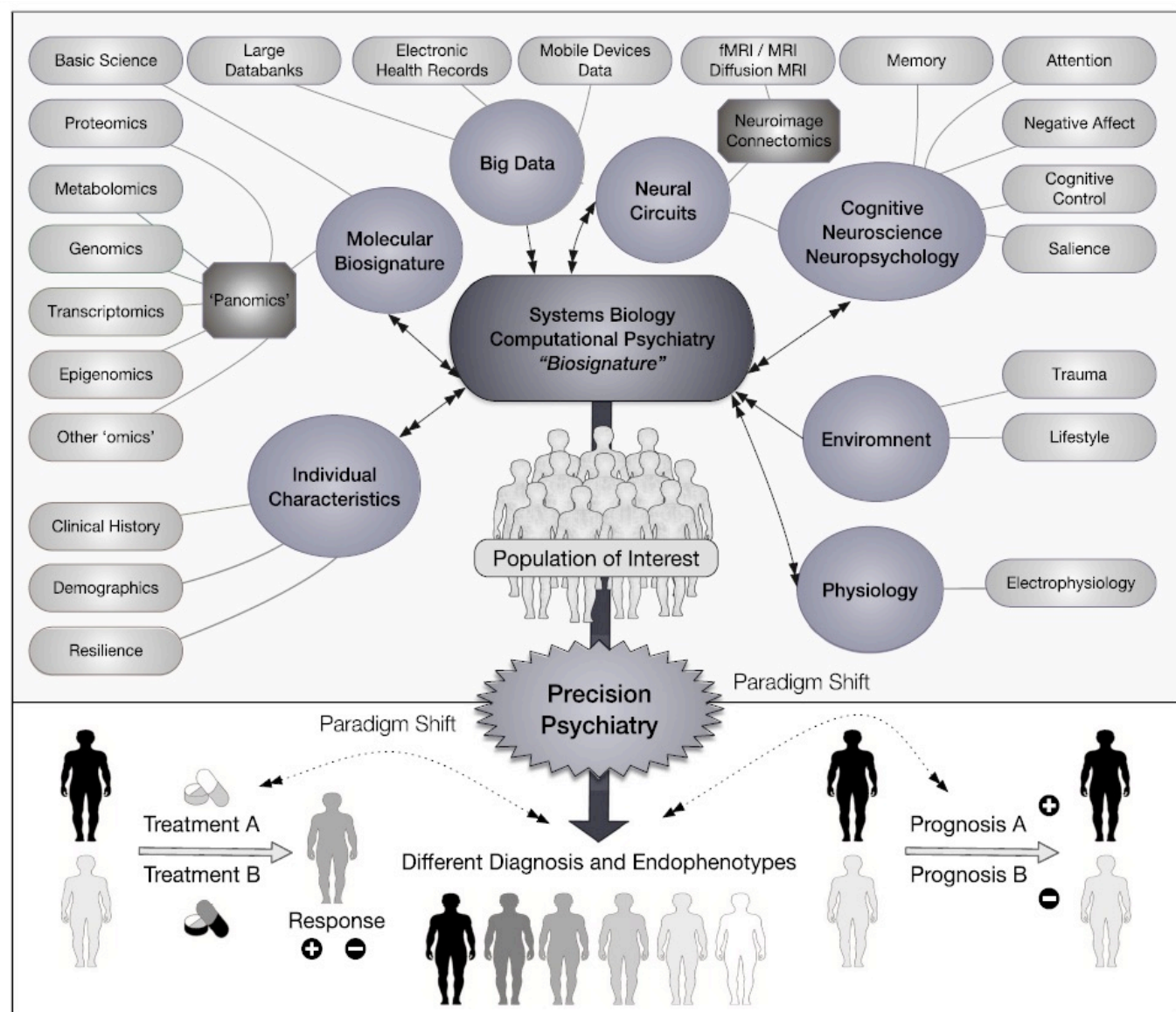
Telemedicine could improve access to medications for opioid use disorder (MOUD). Telemedicine-delivered MOUD (TMOUD) has expanded substantially in response to the restrictions imposed by the COVID-19 pandemic on in-person clinical contact, yet this expansion has not happened consistently across all health systems and countries. This Review aims to understand key factors in TMOUD implementation that might explain variations in uptake. We did a scoping review using three English language databases for articles reporting on the implementation of TMOUD services. 57 peer-reviewed articles were identified, subjected to open coding and thematic analysis, and further interpreted through



Figure 9: A visual guide to TMAT. Diagram adapted from the Welsh National Video Consultation Service Toolkit (TEC Cymru, 2021)



2. Intelligent data and surveillance science: enhanced data collection



Viewpoint

Are Treatment Services Ready for the Use of Big Data Analytics and Artificial Intelligence in Managing Opioid Use Disorder?

Matthew Amer^{1,2}, MBChB, BMSc; Rosalind Gittins³, MPharm; Antonio Martinez Millana⁴, MSc, PhD; Florian Scheibein⁵, BMSc, MSc; Marica Ferri⁶, MSc, PhD; Babak Tofighi⁷, MS, MD; Frank Sullivan², MBChB, PhD; Margaret Handley⁸, MPH, PhD; Monty Ghosh⁹, MD, MBT, MSc, MPH, FRCP, ISAM; Alexander Baldacchino², MBChB, PhD, MD; Joseph Tay Wee Teck², MBChB, PGDip, MSc, MRCGP, ISAM

¹NHS Tayside, Ninewells Hospital, Dundee, United Kingdom

²DigitAS Project, Population and Behavioural Science Research Division, School of Medicine, University of St Andrews, St Andrews, United Kingdom

³Aston Pharmacy School, Pharmaceutical & Clinical Pharmacy Research Group (PCPRG), College of Health and Life Sciences, Aston, United Kingdom

⁴Universitat Politècnica de València, Valencia, Spain

⁵South East Technological University, Waterford City, Ireland

⁶European Monitoring Centre for Drugs and Drug Addiction, Lisbon, Portugal

⁷Friends Research Institute, Baltimore, MD, United States

⁸Department of Epidemiology and Biostatistics, University of California, San Francisco, CA, United States

⁹Department of Medicine, Cumming School of Medicine, 2500 University Drive NW, Calgary, AB, Canada

Informatics

- **Linked Database from Primary (SMR) and Secondary (Clinical) Datasets.**
 - (a) PRESCRIBING: e.g. Pain and analgesics
 - (b) COMPLIANCE of medication and related mortality/morbidities: e.g. Acamprosate
 - (c) OUTCOMES: Suboxone/Methadone study and f/up
 - (d) INTERVENTIONS and Change in dysfunctional behaviour: Alcohol Brief Intervention and outcome
 - (e) RELATIVE and ABSOLUTE RISKS and multiple morbidities

Psychoactive drugs, multimorbidity & mortality

National linked dataset

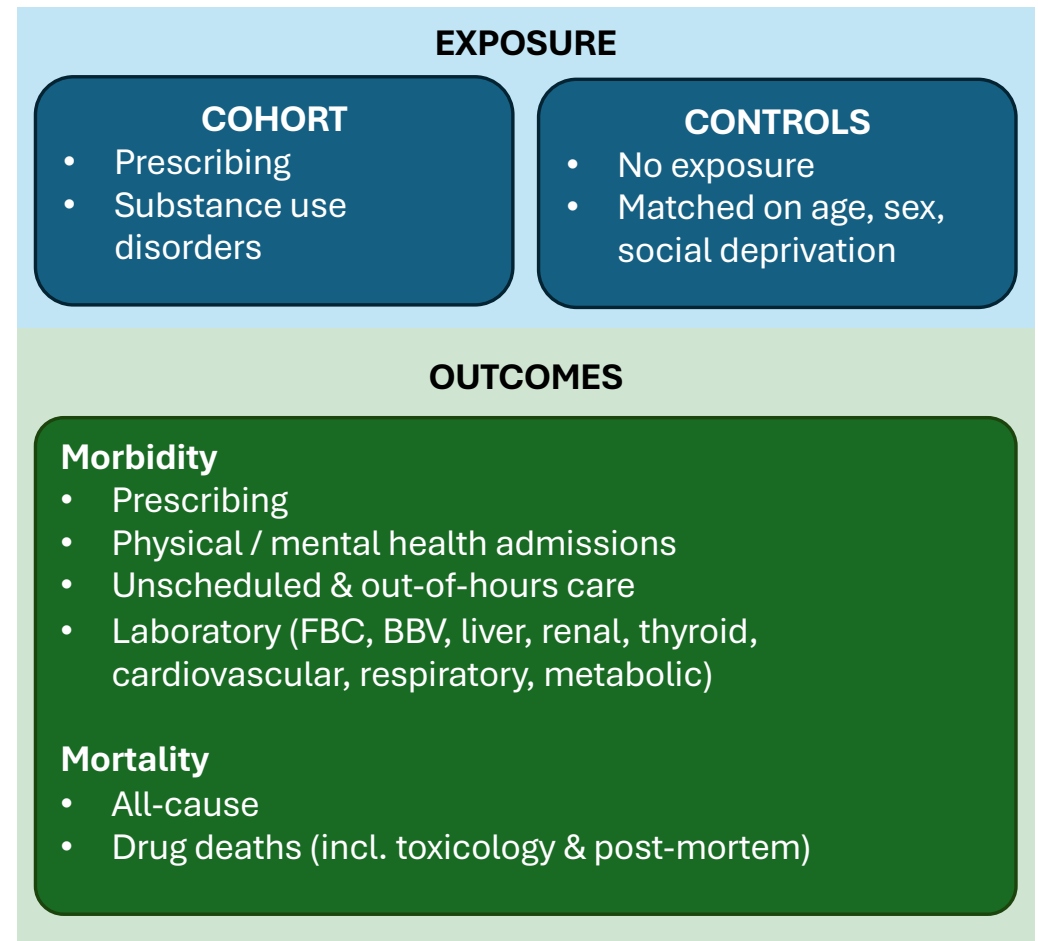
- National Health Service & death registration data.
- 15 years (01/04/09 – 31/03/24)

Psychoactive substances of interest

- Opioids (street, Rx analgesics / for OUD)
- Sedatives (benzodiazepines, gabapentinoids, z-drugs)
- Stimulants (amphetamine, cocaine, other)

Proposed analyses

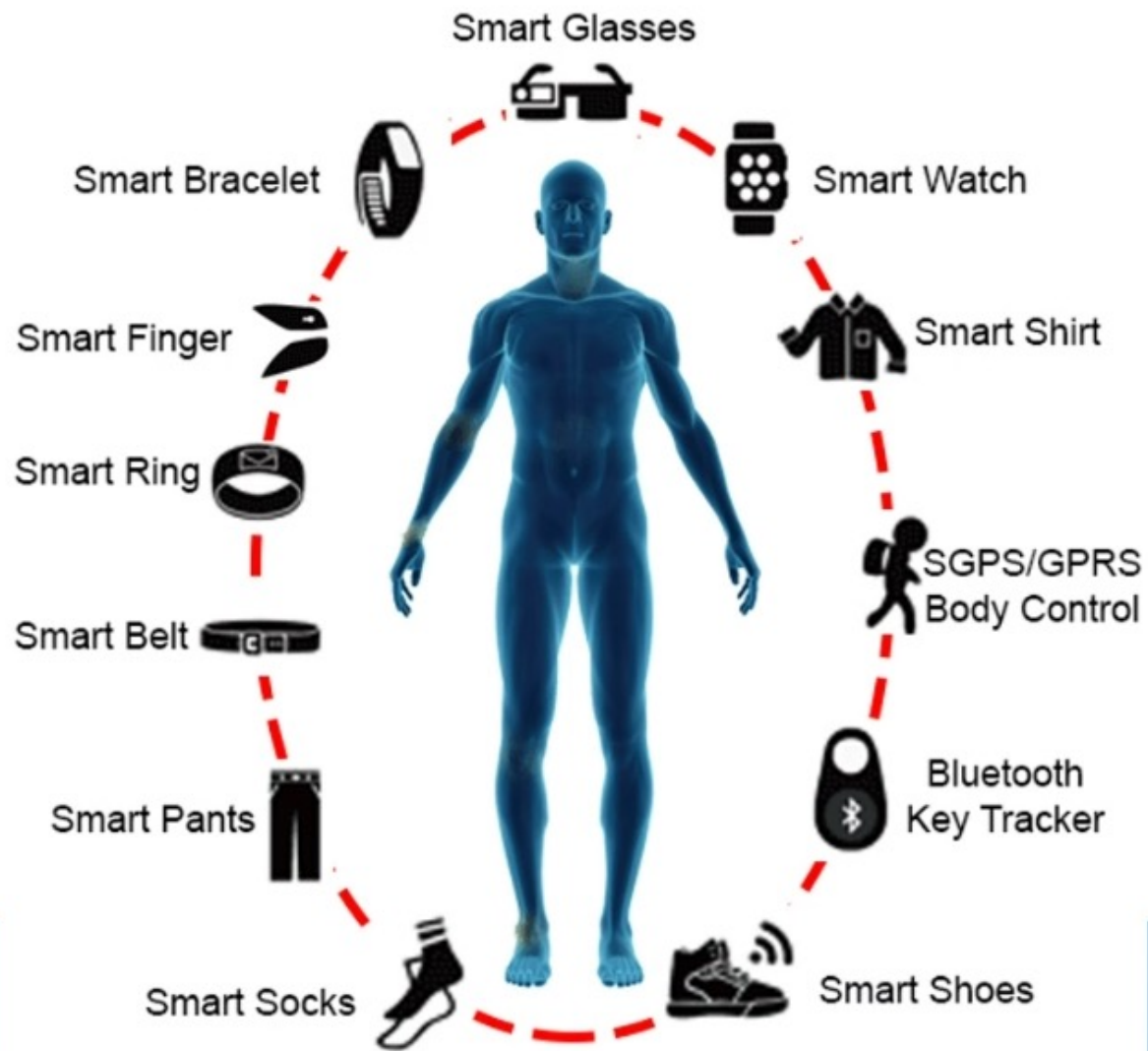
- Multimorbidity clustering and trajectories
- Healthcare service utilisation
- Time to admission, death
- Disease severity
- By substance type, duration & dose, participant characteristics.



3. Technology

Innovation Priorities

- Innovative digital, technologies and therapeutic solutions
- Intuitive, simple, user focused design
- Alert or responder pathways
- To enhance the ability to self-monitor by people who use drugs
- Improved equity of access
- Enhanced simple live intelligent data gathering processes, surveillance and remote monitoring
- Enhance innovative intervention therapeutics
 - antidotes to overdose episodes
 - effective delivery and administration system



Supervised Call/App

DORS
Virtual OD
Response



External/Room-based



Skin patch

Altair Medical



PMD



VitalConnect



Necklace



Clothing tag



Implant



Wrist band/
Smart watch



Ring



Commercial wristbands,
ssmartwatches, rings,
finger sensors

Catalysing Innovation – Current Funding calls

Accelerate
innovation



Improve
outcomes



Increase industry
involvement



Support UK
based R&D



 Office for Life Sciences



£5
m


Reducing Drug Deaths Innovation Challenge

*Catalyse development of innovations to
prevent deaths from overdose*

Digital
Health

Medical
Technologies

Detection | Response | Intervention

 Office for Life Sciences

NIHR | Invention for Innovation

£10
m

Innovation for Treatment and Recovery

*Create innovative tools for treatment of, and
recovery from, opioid or cocaine addictions*

Digital Therapeutics

Pharmaceuticals

Medical Technologies

Opioids | Cocaine | Polydrug use and
co-occurring mental ill health

Overdose Detection and Response



ASSESSOR: A soft skin-interfacing sensor for overdose detection and prevention through remote monitoring



LifeSavr: A wearable device for multi-modal monitoring of oxygen saturation, heart rate, body movements, and respiratory rate for accurate overdose detection.



eMoodie

Saving SAM: A low-cost AI-enabled drug overdose monitoring system. Using a wristband that monitors vital signs and movement patterns, linked to a digital app and alert system.



Overdose Detection and Response



ALERT: A remote monitoring platform designed to make opioid usage safer. A discrete, chest-worn biosensor allows detection of the onset of life-threatening respiratory depression during an overdose event. Paired to a mobile device which allows for the immediate alerting of nearby naloxone carriers and emergency medical service

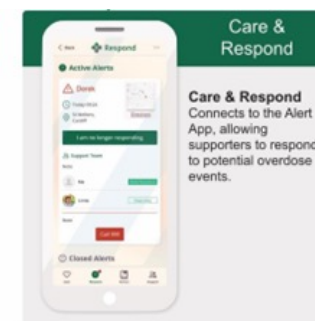
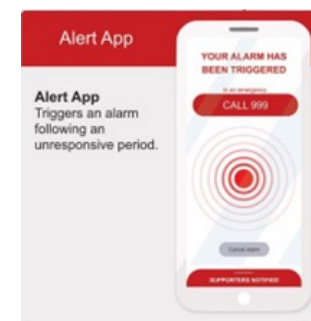


Pneumowave chest sensor device



CHAI999: A low-cost alert and responder pathway

- An Alert App for self-monitoring by drug users, automatically raising an alarm if they become unresponsive, and
- A Care & Respond App for trusted supporters to provide coordinated help.



Overdose Intervention



Ultra-portable fast-dispersal buccal naloxone for constant carriage: KCL are developing rapid-dispersal naloxone wafers to improve the accessibility and portability of this life-saving emergency antidote medication. The proposed naloxone wafers disintegrate within seconds and can easily fit into a wallet or purse



Office for
Life Sciences

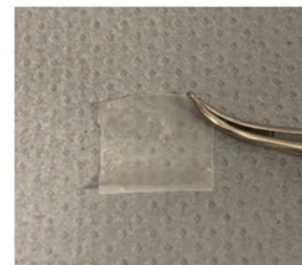


CHIEF
SCIENTIST
OFFICE



MESOX

RescuePatch: Controlled-release combination patch for naloxone and flumazenil delivery has developed an innovative transdermal combination patch of the antidotes Naloxone and Flumazenil as a therapeutic intervention. The skin patch is designed for wide application by non-professionals in the community.



Lessons Learned #1

- Acknowledging digital divide
- Reach in different settings
- Combined with face-to-face interventions
- Flexibility and continuous adaptation
- Data security and privacy
- Sustainability
- Need to strengthen evaluation to be safe and effective
- Guidance on how to use AI and other innovative digital tools safely
- Strengthened collaboration with academia, civil society, law enforcement, criminal justice and social sectors

Lessons Learnt #2: Engage stakeholders early

Who?	Why?	How?
<ul style="list-style-type: none">• Patients with lived experience• Clinicians (e.g., MAT providers, social workers, primary care)• Community health centers• Payers (Medicaid MCOs, Medicare Advantage, private insurers)• Criminal justice system (if relevant)• Behavioral health policymakers and public health officials	<ul style="list-style-type: none">• Helps identify <i>real-world constraints</i> early• Builds <i>buy-in and trust</i> from those who will adopt the innovation• Surfaces insights missed in academic research (e.g., implementation workflows, stigma)	<ul style="list-style-type: none">• Conduct structured stakeholder interviews (e.g., patient journey mapping, provider workflow mapping)• Use advisory boards or focus groups from the start—not post hoc• Co-develop your value proposition and implementation plan

Common pitfall:

Designing in a silo, then discovering too late that it doesn't fit into workflows

Lessons Learnt #3

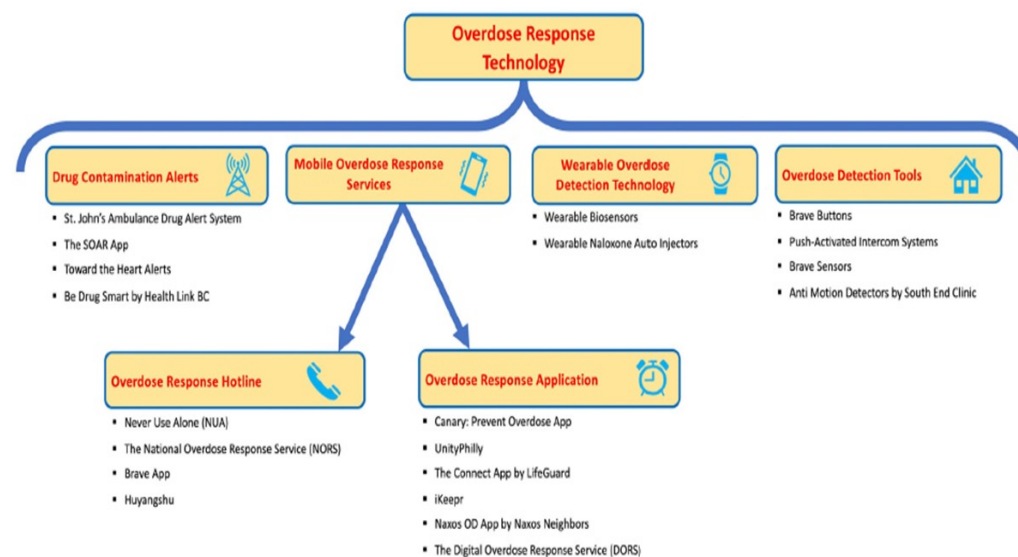
Received: 26 July 2024 | Revised: 18 March 2025 | Accepted: 20 March 2025
DOI: 10.1111/dar.14055

ORIGINAL PAPER

Drug and Alcohol Review WILEY

Defining terminology and outcome measures for evaluating overdose response technology: An international Delphi study

William Rioux¹ | Dylan Viste² | Navid Sedaghat¹ | Nathan Rider² | Joseph Tay Wee Tek³ | Melissa Perri⁴ | David G. Schwartz⁵ | Kim Ritchie⁶ | Giuseppe Carrà^{7,8} | Stephanie Carreiro⁹ | Oona Kreig¹⁰ | Gabriela Marcu¹¹ | Joseph Arthur¹² | Joanne Cogdell¹³ | Mike Brown¹⁴ | Tyler Marshall² | S. Monty Ghosh^{1,15}



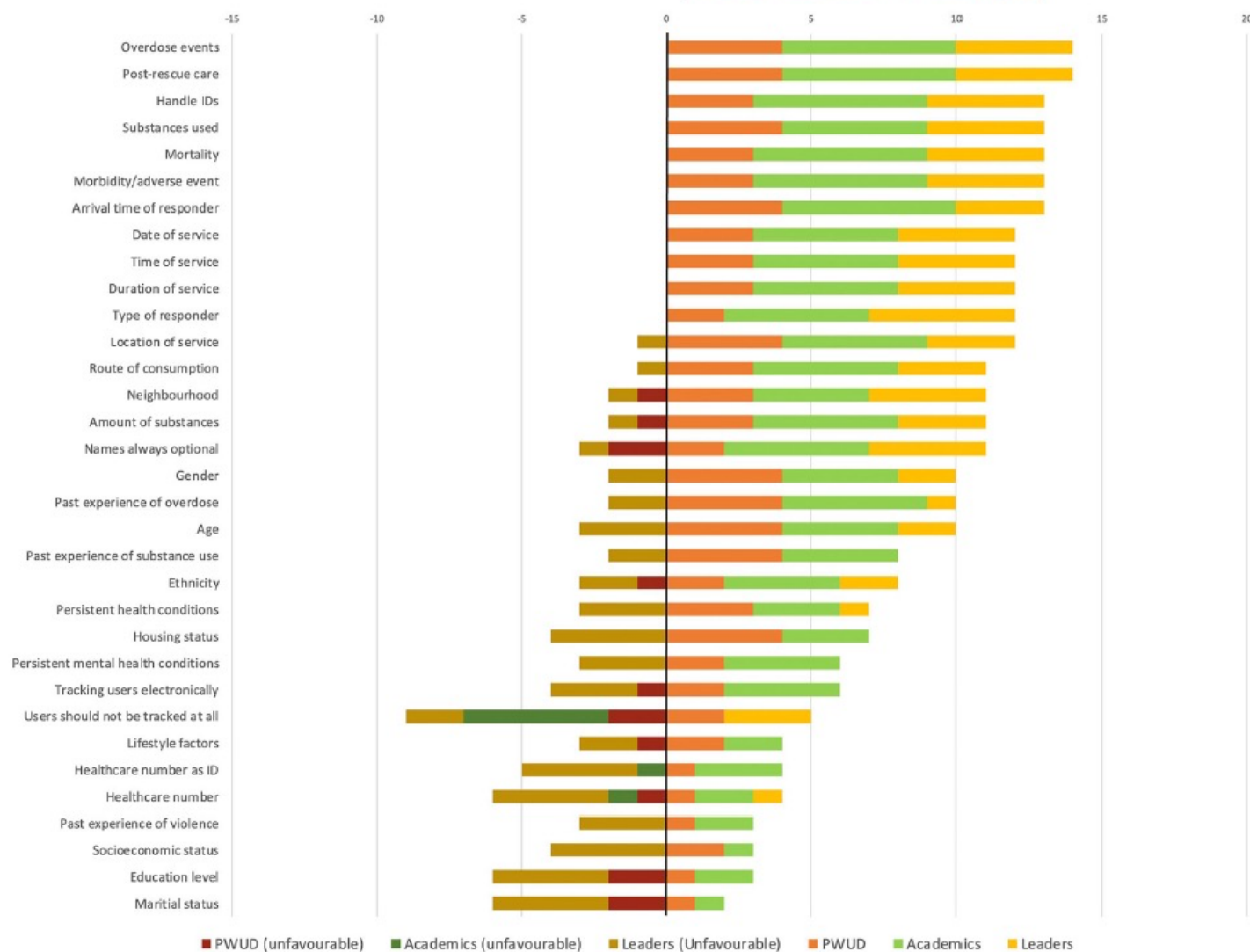


FIGURE 3 A summary of the demographic and outcomes data recommended for data collection.



Register Now!
regular: 75€
students: 25€

ISAM Global ADDICTION THERAPEUTICS INNOVATION DAY

“Where Ideas and Industry Meet”

- Flash talks
- Presentations
- Panel Discussions
- Networking Platforms



NIH National Institute
on Drug Abuse



International Society of Addiction Medicine presents: The First **Global Addiction Therapeutics Innovation Day** as a full-day preconference event in Hamburg, Germany, on **May 25th** designed for academia/ industry partnership, focusing on innovation and investment in newest technologies for helping patients affected by addictions and their comorbidities.

Join us to shape the future of addiction care!



isamweb.org/global-therapeutic-innovation-day

innovation@isamweb.org

isam.mdorozio@gmail.com

ISAM Global ADDICTION THERAPEUTICS INNOVATION DAY 2026

September 30th, 2026
ROTTERDAM, THE NETHERLANDS



Featuring **INNOVATION AWARD**
(The Golden Brain) for the most innovative idea
in Addiction Medicine Therapeutics and Diagnostics



Award applications will start in 1 March 2026

innovation@isamweb.org
isam.mdorozio@gmail.com
isamweb.org/innovation-award/
isamweb.org/global-therapeutic-innovation-day

ISAM
INTERNATIONAL SOCIETY OF
ADDICTION MEDICINE





University of
St Andrews | FOUNDED
1413 |



amb30@st-andrews.ac.uk



University of
St Andrews

