

Cover Sheet

Title: **ARC - Health: Healthier and More Sustainable Lifestyles for All in Scotland**

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Interested Partner universities/organisations: **Abertay University, Edinburgh Napier University, Glasgow Caledonian University, Heriot-Watt University, James Hutton Institute, Robert Gordon University, University of Aberdeen, University of Dundee, University of Edinburgh, University of Glasgow, University of the Highlands and Islands, University of St Andrews, University of Stirling, University of Strathclyde, University of the West of Scotland**

Disciplines that would be included: **Life Sciences, Social Sciences, Medical/Clinical Sciences, Computational Sciences, Engineering, Economics, Health Psychology, Medical Physics, Chemistry, Population Health Sciences**

A brief description of the proposed challenge area that covers

ARC-Health tackles the challenge of creating healthier and more sustainable lifestyles for all in Scotland. The influences on an individual's health and wellbeing are multifactorial and interconnected, requiring a whole-system thinking approach, to create solution-focussed innovations, which ARC-Health will deliver.

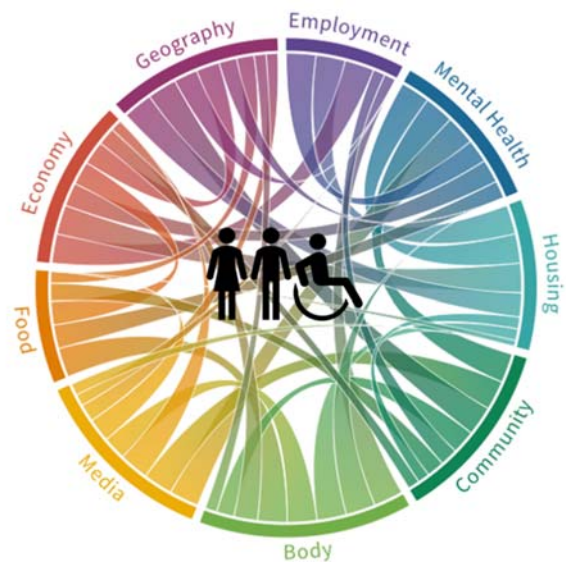
Scotland is one of the World's wealthier nations, but our overall health is poor compared to other wealthy countries, due to unhealthy diets, sedentary lifestyles, and growing inequalities. For example, obesity is the second biggest contributory factor to death and disability in Scotland after smoking, costing our economy an estimated £4.6 billion/yr¹. Obesity has strong links with inequality, with a higher risk of obesity in children from the most deprived areas². Globally, poor diet and lack of physical activity are a leading risk to health³, contributing to multiple non-communicable diseases. Scotland can be a global leader on this Grand Challenge by adopting a community-centred, data-driven innovation approach, and engaging with the world class expertise and infrastructure in research and innovation right here in Scotland. **By reducing the burden of disease and disability on individuals and on society, ARC-Health can reduce health inequalities and increase societal productivity, bringing a longer healthier life expectancy to all.**

ARC-Health is closely aligned with Scottish Government priorities that have led to **Scotland's Physical Activity Delivery Plan⁴** and will have impact across the **National Outcomes of the Scottish National Performance Framework²**, particularly for Children and Young People; Communities; Economy; Health; and Poverty. ARC-Health will gather and shape evidence on how to better address policy programmes of action in Scotland's National Strategy for Economic Transformation⁵ including reorientation of our economy towards wellbeing and fair work. For example, by examining how health interventions and provisions can help to tackle health inequalities and impacts on labour market and related outcomes such as child poverty⁶.

ARC-Health brings together expertise in Life, Social, Medical, Computational, and Physical Sciences, alongside Agriculture and Engineering (see Appendix A), focused through missions on BODY, FOOD and COMMUNITY. These missions will draw on Scotland's strengths in areas such as [Healthy Ageing](#), [Health Technologies](#), [Precision Medicine](#), [Data-Driven Innovation](#) and [Digital Health](#).

Mission BODY (Individual level)

Physical, emotional, and mental health determine quality of life and these factors are impacted by a variety of influences (see diagram to right), yet the complex interplay between these and our genetic make-up is still poorly understood. Mission BODY will provide the coherent and methodological alignment across several multi-disciplinary projects to translate high-quality research into high quality solutions for the real-world. **With significant strength in Scotland, aligned with the UK's Innovation Strategy⁷ and Life Sciences Vision⁸, this mission will bring together research strength** in areas such as; the compounding impact of diet and lifestyle choices on the development of [multiple morbidities](#), innovative approaches to [early detection of disease](#), impacts of our [microbiome on brain health](#), advancements in [personalised medicine](#) and [novel therapies that aim to reduce a widening of the health inequalities gap](#).



Mission FOOD (Systemic level)

Healthy, sustainable eating patterns are associated with improved health outcomes⁹. Access to sufficient or adequate-quality food (food security¹⁰) is not equal across society and is likely linked to the socio-economic differences in the rates of obesity and chronic disease in Scotland¹¹. To reduce the health inequality gap, and reduce prevalence and severity of disease, the quality and cost of food and drink in Scotland requires a transformation. Mission FOOD, aligned with the UN Sustainable Development Goal II, is uniquely placed to drive a spectrum of innovation from nutrition to sustainable agriculture and food security whilst also contributing to Scotland's NetZero ambitions. This mission will draw on evidenced research strengths in our brewing and distilling industries and [adapted microbial fermentation technology](#) offering sustainable production of high-protein, nutrient-dense alternatives to meat, and understanding [changes in our food habits](#) and innovation through [indoor vertical farming](#).

Mission COMMUNITY (Community Level)

Research happens in the research community and social change happens in communities. Mission COMMUNITY will build a coordinated programme of research projects that will transform transdisciplinary research by developing novel computational routes to store, link and analyse research data across the disciplines in the ARC and more widely. This will be achieved through close association with important initiatives such as [iCAIRD](#). In communities, Mission COMMUNITY will coordinate Scottish research expertise in [complex adaptive systems](#), [ethics](#), [security](#), [privacy](#), [internet of things](#) and [design](#). That infrastructure will empower researchers, policymakers, communities, and individuals to understand lifestyle change and how issues transform as new initiatives are introduced. This will involve close cooperation with the social sciences to co-design socio-technical systems that are engaging and ethical, providing the key digital infrastructure underpinning our reverse translation feedback methodology.

The breadth of **ARC-Health enables a coherent, transdisciplinary approach to a priority Grand Challenge for Scotland, and the world, whilst Missions provide the specificity required and a framework to deliver tangible outcomes** (targets would be set within the ARC development phase). Missions will contribute to the whole-system approach through overlap and intersection where relevant e.g., the interplay between nutrition and brain health and how communities engage and are incentivised to revise their approach to nutrition (Food, Body and Community).

Success within this public health priority demands a holistic, whole system outlook¹² that enables a personalised approach to prevention, treatment and management that considers our biology, our experiences, and our environment. A reverse translation feedback approach to transdisciplinary research will keep all ARC-Health research programmes focussed on solutions to the challenge. Pivotal to ARC-Health are the needs **(1) to work across a wide range of disciplines where end-user needs are continually considered to adjust the direction of development** and **(2) to deliver the impact of research on a diverse population**. This is a significant benefit of the coordination provided by ARC-Health.

Suggested future or current defined funding opportunity(ies) which an ARC focused on this challenge would be well-placed to target

Our grand challenge is strongly aligned with UK and Scottish Governments priority areas presented in the UK Research and Development Roadmap¹³ and Scotland's National Strategy for Economic Transformation⁵. Research addressing health inequalities, healthy ageing, the creation of a resilient

society, and improved healthcare outcomes are also areas of strategic importance for the UKRI, NIHR, and Horizon Europe.

The transdisciplinary ARC-Health coalition will allow funding to be accessed through UKRI research councils including BBSRC, MRC, EPSRC, ESRC, and Innovate UK. Examples of current relevant funding calls are:

- [Diet and Health Open Innovation Research Club](#) (£10,000,000), funded by BBSRC
- [Digital Health Hub Pilot Scheme](#) (£8,000,000), funded by EPSRC
- [Biomedical catalyst 2022 round one: industry-led R&D](#) (£15,000,000), funded by Innovate UK

In addition to funding, ARC-Health will interact at a UK level with UKRI strategic activity, e.g. MRC's Health Inequalities forum, to support connectivity of our researchers with the funding landscape and will look to sustainability or growth funding of ARC-Health:

- [Build Community Research Consortia to Address Health Disparities](#) (max. bid £250k) joint-funded by AHRC, MRC, NERC, and ESRC

Horizon Europe draft work packages for 2023-24 in healthcare focus on resilience and prevention, the impact of environment on health, and the integration of tools and data to improve healthcare*. For example, €100M will be made available for [EU Partnerships on Personalised Medicine](#). The National Institute of Health and Care Research's funding is centred around multi-morbidities, digital health, and sustainable healthcare including a Health Technology Assessment call ["Towards Evaluation of Digital and Technology-enabled Healthcare"](#) (£100k max. bid).

Charitable foundations, such as Wellcome, the British Heart Foundation (BHF), and Diabetes UK increasingly issue joint calls, e.g. BHF and Diabetes UK have a joint-funding call for research programmes and clinical trials for [the prevention and treatment of cardiovascular disease in those with diabetes](#) – two morbidities commonly associated with poor diet and health. Meanwhile, Wellcome has prioritised 'climate and health' and 'mental health' which address food security, agricultural practices, and the societal and individual impacts of poor health. By focusing on long-term, transdisciplinary challenges ARC-Health will align with the future of funding in these areas and lobby on behalf of Scotland's research strengths at a policy, strategy, and funding level¹.

A brief description of the prospective or potential coalition of universities and others involved which could deliver an ARC in this area. This should indicate who would lead.

The development of ARC-Health has been led by three of the existing research pools [SULSA \(Life sciences\)](#), [SINAPSE \(Medical imaging\)](#) and [SICSA \(Informatics and Computer science\)](#), with their collective capacity to facilitate a multidisciplinary approach fully demonstrated through the insights gained from across Engineering, the Physical and Social Sciences, Public Health experts and policy makers. Further outputs from cross-Pool interaction can be found at the Research Innovation Scotland website, [Our Future Health Workshop, and its associated funding call co-funded by Scottish Innovation Centres](#).

This ARC will also benefit from support from: [DHI](#), the Digital Health and Care Innovation Centre; [CENSIS](#), Scotland's Innovation Centre for sensing, imaging and Internet of Things technologies; [MDMC](#), the Medical Device Manufacturing Centre; [DDI](#), Data Driven Innovation Infrastructure; [CPI](#), the Centre

* Although UK participation in Horizon Europe is not guaranteed, these future work programmes indicate the direction of travel of leaders and shapers in the research community.

for Process Innovation; various KTNs; and the [Office of the Chief Economic Advisor](#), Scottish Government. Further potential partners are listed in Appendix B.

In its first iteration, ARC-Health will be legally affiliated to the University of Glasgow for administrative convenience as it currently hosts SULSA, SINAPSE and SICSA. However, the open nature of the consortium is essential and central, with researchers from all of the associated institutions welcome to join sub-groups to pursue individual funding streams.

The added benefit that would be brought by SFC funding.

ARC-Health brings together diverse perspectives and creates novel interactions through a transdisciplinary lens, **building next-generation networks by extending SFC investments in cross-institutional collaborative research**. Its ambition will be achieved by linking the strong foundation of existing networks across academia, industry, the NHS, and policy makers within both the Pools and associated partners.

SFC funding for ARC-Health will catalyse a programme of research projects, at scale, that are coordinated by our reverse translation feedback methodology to retain focus on the challenge across all the individual projects. This ARC-Health coordinated approach, across a range of engaged partners, beneficiaries, and end-users, will improve success rates on proposals because they link effectively from ideation to innovation and through to impact. In addition, this approach lends itself to the **leveraging of ambitious research project funding, requiring input not just from the bench to bedside but also to population behavioural change and policy intervention**. As ARC-Health succeeds it will place Scottish researchers in a good position to shape future work programmes and bring more research effort to bear on the ARC-Health challenge of Healthier and More Sustainable Lifestyles for All in Scotland.













SFC funding will enable equal access to opportunity for researchers from 15 higher education and research institutions, alongside key partners in the health and wellbeing landscape, to elicit novel and innovative research potential and drive investment into Scotland's research community.

ARC-Health connects across Scotland's innovation ecosystem through the SFC-funded Innovation Centres, that involve private, public, third sector and others and, combined with the Pools' existing industry collaborators, builds partnerships tailored to specific funding calls that support commercialisation.

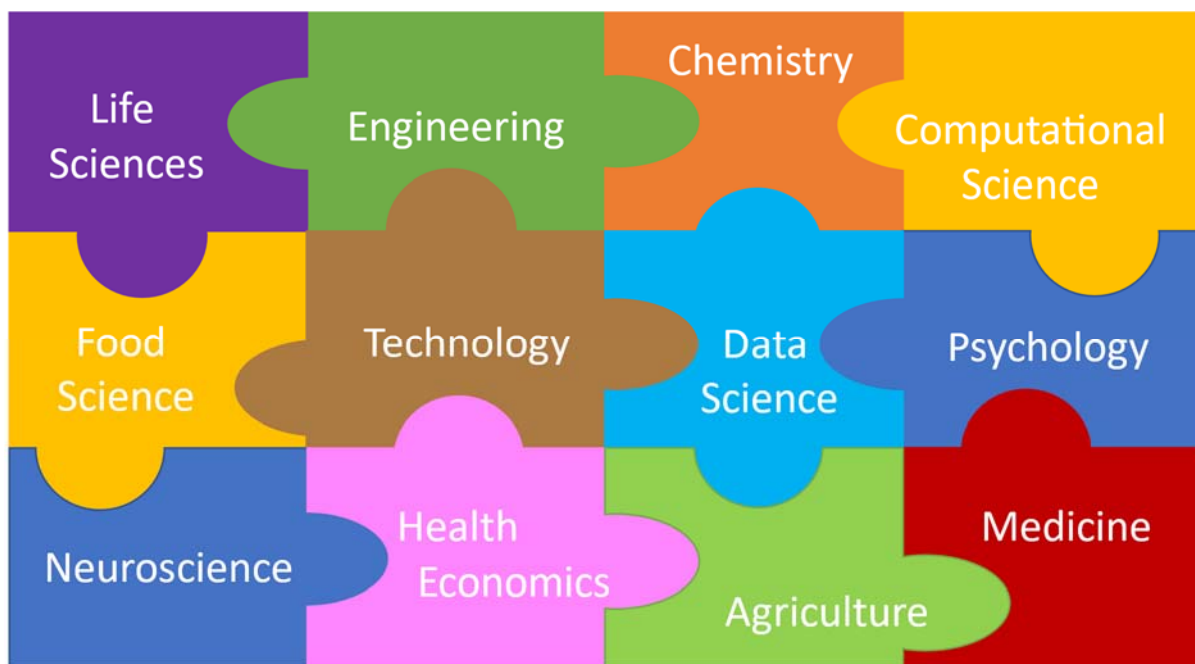
ARC-Health will work closely with the other Alliances to share knowledge and learnings and be responsive to opportunities that would benefit from a combined effort. More broadly, ARC-Health will seize opportunities to support the wider landscape for example in interdisciplinary training within the ESRC DTP within the Scottish Graduate School for Social Sciences.

Targeted SFC funding will enable delivery of outputs including, but of course not exclusively: mapping of existing activity around our Grand Challenge; identification of unlocked potential strengths and areas to build on; jointly supportive horizon scanning for funding opportunities and associated facilitation of consortia bids; and multi-institution, transdisciplinary and cross-sectoral network building.

Appendix A – The role of ARC-Health as a connector of activity toward a more coherent ecosystem for healthier and sustainable lifestyles for all in Scotland.

 <p>Life Sciences</p> <p>Understanding, diagnosing, and treating disease associated with poor health</p>	 <p>Chemistry</p> <p>Exploring new medicines and novel methods of producing food</p>	 <p>Food Science</p> <p>Understanding how food and nutrients interact with microbiome</p>	 <p>Health Economics</p> <p>Investigating societal impacts of changed behaviour and interventions</p>	 <p>Engineering</p> <p>Developing medical devices and biomaterials to prevent, monitor, and treat disease</p>	 <p>Neuroscience</p> <p>Understanding connection between unhealthy lifestyles and neurodegeneration/ageing</p>
 <p>Computational Science</p> <p>Developing accessible databases, software development and personalisation</p>	 <p>Psychology</p> <p>Understanding and treating impacts of unhealthy lifestyles on mental health</p>	 <p>Data Science</p> <p>Analysing clinical and experimental data to identify areas of priority</p>	 <p>Technology</p> <p>Developing and producing novel food stuffs and therapies</p>	 <p>Medicine</p> <p>Diagnosis and personalized treatment of comorbidities associated with poor diet</p>	 <p>Agriculture</p> <p>Understanding impacts of climate change on food security and produce more resilient crops</p>

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ARC-Health



Appendix B – Potential Partners

Partners will be involved in the development and delivery of work packages centered on mission BODY, FOOD, and COMMUNITY. Their expertise and networks will be utilised to build upon the whole-system and multidisciplinary approach envisioned by this ARC.



Appendix C - References

1. <https://www.gov.scot/publications/scotlands-public-health-priorities/>
2. <https://nationalperformance.gov.scot/measuring-progress/national-indicator-performance>
3. https://www.who.int/health-topics/healthy-diet#tab=tab_1
4. <https://www.gov.scot/publications/active-scotland-delivery-plan/>
5. <https://www.gov.scot/publications/scotlands-national-strategy-economic-transformation/>
6. <https://www.gov.scot/news/tackling-child-poverty-delivery-plan-2022-26/>
7. <https://www.gov.uk/government/publications/uk-innovation-strategy-leading-the-future-by-creating-it>
8. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1013597/life-sciences-vision-2021.pdf
9. <https://www.bda.uk.com/resource/one-blue-dot.html>
10. <https://www.gov.scot/publications/scottish-health-survey-2019-volume-1-main-report/>
11. <https://digital.nhs.uk/data-and-information/publications/statistical/statistics-on-obesity-physical-activity-and-diet>
12. <https://publichealthreform.scot/publications/whole-system-approach-for-the-public-health-priorities>
13. <https://www.gov.uk/government/publications/uk-research-and-development-roadmap>