

Institution: University of Edinburgh		
Unit of Assessment: 24 (Sport and Exercise Sciences, Leisure and Tourism)		
Title of case study: Enhancing global, UK and Scottish physical activity policy and guidance		
Period when the underpinning research was undertaken: 2014 – December 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Prof Nanette Mutrie	Chair in Physical Activity for Health	2012 – present
Dr Claire Fitzsimons	Lecturer in Physical Activity for Health	2012 – present
Dr Paul Kelly	Reader in Physical Activity for Health	2014 – present
Period when the claimed impact occurred: 1 January 2014 – 31 July 2020		
Is this case study continued from a case study submitted in 2014? No		
1. Summary of the impact		
<p>The Physical Activity for Health Research Centre (PAHRC) has evidenced the global health benefits of walking and cycling, quantified physical activity policy outcomes to measure their effectiveness, and challenged previous studies to advance policy and practice. PAHRC's internationally recognised researchers have impacted the effectiveness of global and national policies by:</p> <ul style="list-style-type: none"> • making critical contributions to the World Health Organization's (WHO) international economic assessment of the benefits of walking and cycling • changing physical activity policy in Scotland by introducing indicators that track recommendations regarding increased rates of muscle strengthening, balance and coordination as well as reduced sedentary behaviour • shaping UK Physical Activity Guidelines to support more individuals in becoming physically active. <p>The WHO Member States, the UK Government and the Scottish Government have benefitted directly from this research.</p>		
2. Underpinning research		
<p>PAHRC's research contributes to the solutions required to address the challenges of the physical inactivity pandemic. One key way it does this is by providing evidence to inform, underpin and change physical activity policy at local, national and global levels.</p>		
Evidencing the health benefits of walking and cycling globally		
<p>Kelly led research that developed novel statistical models and was the first to show that a weekly dose of 150 minutes of walking or cycling per week can reduce the risk of premature</p>		

death by around 10%, regardless of overall levels of physical activity. The study involved a systematic review and meta-analysis of 14 longitudinal studies involving more than 200,000 participants from Europe, the US, China and Japan (3.1).

He also contributed these findings to a later study which was the first to model them against air pollution data on a global scale. The team's analysis indicated 150 minutes of walking or cycling each week outweighs the risks from air pollution in 98% of the world's cities. The findings challenged previous assumptions to the contrary, which were a barrier to behaviour change (3.2).

Measuring the effectiveness of physical activity policy in Scotland

Mutrie, Fitzsimons and Kelly's analysis of data from the Scottish Government's Scottish Health Survey 2013 suggested that the ways people stay active vary by age group and circumstances. They found walking accounted for as much as 30% of weekly physical activity among Scottish adults who meet the UK Chief Medical Officer's (UK CMO) guideline of 150 minutes of physical activity, and this proportion increased with age. Team sports contributed less than 5% of people's weekly activity. Meanwhile, domestic and gardening tasks made up more than 50% of insufficiently active people's weekly activity. The research indicated efforts to encourage more people to meet the guideline levels of physical activity might be more effective if they focused on activities other than sports (3.3).

The researchers challenged previous analysis of UK data which suggested older adults are the most sedentary age group. In examining data on more than 14,000 Scottish adults, the researchers found this was incorrect since previous studies did not consider the significant time people spend seated at work (3.4). A key contribution of this research was recommending interventions to reduce work-related sedentary time.

Mutrie, Fitzsimons and Kelly also found that fewer Scottish adults met the UK CMO's weekly guidelines for muscle strengthening (<30%) or balance promoting (<15%) exercises than completed the recommended amount of aerobic activity (65%). The research indicated the need for policy adjustment to better support the Scottish Government's stated goals for overall physical activity (3.5).

Testing the accuracy of population health measurement across the UK

Kelly's research challenged previous studies that suggested the proportion of children achieving the recommended level of weekly activity was higher in Scotland than in England. He demonstrated that the difference in Scottish Health Survey estimates (70%) and those in the Health Survey for England (25%) was the result of variation in data collection and analysis methods (3.6).

3. References to the research

3.1 **Kelly, P.**, Kahlmeier, S., Götschi, T., Orsini, N., Richards, J., Roberts, N., Scarborough, P., Foster, C. (2014) Systematic review and meta-analysis of reduction in all-cause mortality from walking and cycling and shape of dose response relationship. *International Journal of Behavioural Nutrition and Physical Activity*. 11(132). <https://doi.org/10.1186/s12966-014-0132-x>

3.2 Tainio M., de Nazelle A.J., Götschi T., Kahlmeier S., Rojas-Rueda D., Nieuwenhuijsen M.J., de Sá T.H., **Kelly P.**, Woodcock J. (2016) Can air pollution negate the health benefits of cycling and walking? *Preventive Medicine*. 87, 233-236

<https://doi.org/10.1016/j.ypmed.2016.02.002>

3.3 Strain, T., **Fitzsimons, C.**, Foster, C., **Mutrie, N.**, Townsend, N., **Kelly, P.** (2016) Age-related comparisons by sex in the domains of aerobic physical activity for adults in Scotland. *Preventive Medicine Reports*. 3, 90-97

<https://doi.org/10.1016/j.pmedr.2015.12.013>

3.4 Strain, T., **Kelly, P.**, **Mutrie, N.**, **Fitzsimons C.** (2017) Differences by age and sex in the sedentary time of adults in Scotland. *Journal of Sports Sciences*. 36(7), 732-741

<https://doi.org/10.1080/02640414.2017.1339904>

3.5 Strain, T., **Fitzsimons, C.**, **Kelly, P.**, & **Mutrie, N.** (2016) The forgotten guidelines: cross-sectional analysis of participation in muscle strengthening and balance & co-ordination activities by adults and older adults in Scotland. *BMC Public Health*. 16(1), 1-12

<https://doi.org/10.1186/s12889-016-3774-6>

3.6 Williamson, C., **Kelly, P.** & Strain, T. (2019) Different analysis methods of Scottish and English child physical activity data explain the majority of the difference between the national prevalence estimates. *BMC Public Health*. 19(1) <http://doi.org/10.1186/s12889-019-6517-7>

4. Details of the impact

Enhancing global economic assessment of the benefits of walking and cycling

Kelly's research linking a quantified dose of regular weekly walking or cycling to reductions in the risk of premature death of around 10% (3.1) has informed global transport policies to improve public health and promote sustainability. In 2014, the WHO adopted Kelly's unique statistical modelling to critically underpin the calculations used in its Health Economic Assessment Tool (HEAT). HEAT is dependent on this statistical modelling to help policymakers, researchers and physical activity advocates answer the question: *if X people cycle or walk Y distance on most days, what is the economic value of mortality rate improvements?* [5.1]. HEAT weighs the benefits of walking and cycling against factors such as pollution, injuries and carbon impact assessments. The tool uses the findings from Kelly's research to provide cost-benefit analyses and economic valuations of transport or infrastructure projects. These calculations would not be possible without the findings from Kelly's research, which are the key aspect of the tool's calculations. HEAT is designed to benefit professionals at national and local levels, including transport and urban planners, traffic engineers, health economists, physical activity experts and health promotion experts [5.1].

In 2017, WHO updated HEAT and introduced the results from the later study Kelly contributed to, which showed the benefits of walking and cycling outweigh the adverse health effects of exposure to air pollution (3.2). The inclusion of these results further enhanced the tool's economic modelling power [5.1].

In May 2018, the Senior Policy and Programme adviser and coordinator of HEAT wrote, "[Kelly's paper 3.1] remains a cornerstone of the HEAT, [it] provides... the information on how much risk of mortality is reduced from a given level of walking or cycling" [5.2].

Furthermore, *“The HEAT has been applied in several countries and continues to inform and impact policy and planning decisions, making the case for better walking and cycling environments. England and Sweden have included the HEAT in their Official National Guidance, and Austrian, Finnish and French governments have promoted the tool for in-country use”* [5.2].

Changing physical activity policy in Scotland

The Scottish Government introduced changes to how it measures people’s activity levels in the revised 2018 Active Scotland Outcomes Framework (ASOF), as a direct result of PAHRC’s research. Describing Scotland’s ambitions for sport and physical activity, the ASOF contributes to the delivery of the Scottish Government’s National Performance Framework, which aims to create a more prosperous, sustainable and inclusive country. In a February 2020 letter, The Scottish Government’s Head of Strategy, Active Scotland Division, Caspian Richards stated: *“This research has shaped the set of indicators used to monitor progress in implementing our range of policies to increase the physical activity levels of people in Scotland”* [5.3]. Richards highlighted several specific improvements to the indicators [5.3]:

- *“indicators to track the proportion of adults in Scotland meeting muscle strengthening and balance and coordination recommendations have been included in our published physical activity indicator set [informed by 3.3 and 3.5]*
- *similarly, an indicator to track sedentary time has been included [informed by 3.4]*
- *the analysis of physical activity child data [3.6] will be used to inform ongoing consideration of opportunities to inform the comparability of physical activity measures in different parts of the UK”.*

In January 2018, Julie Guy, Senior Research Officer, Health and Social Care Analysis in the Scottish Government, wrote *“[Mutrie, Fitzsimons and Kelly’s analysis of] Scottish Government data showed the importance of muscle strengthening and balance activity and the key role of sedentary time on health. The Evidence Group of the National Strategic Group for Physical Activity (NSG) used this evidence to develop recommendations for headline outcomes for [the ASOF] physical activity policy. The NSG chaired by the Minister for Public Health and Sport have welcomed this work and sanctioned the inclusion of measures of muscle strength and sedentary time into headline outcomes that drive improvements of physical activity for health across Scotland”* [5.4].

Developing UK Chief Medical Officers’ (UK CMO) Physical Activity Guidelines

Mutrie, Fitzsimons and Kelly’s research (3.3, 3.5) played a vital role in the development of the 2019 UK CMO Physical Activity Guidelines by recognising variations in physical activity by age group and sex as well as acknowledging the relatively low proportion of people who meet existing recommendations for muscle strengthening or balance-promoting activities.

The guidelines [5.5] cited both studies (3.3, 3.5), and page 39 included a specific reference to the research as justification for updates to UK CMO recommendations. It stated: *“...changes have been made to the previous guidelines to take account of new evidence. Given the lower levels of physical activity amongst the population of older adults [references to research 3.3 and 3.5], small increases in the volume of daily physical activity can produce important health and functional benefits. ...These revised guidelines for older adults therefore give greater emphasis to regular light activity”* [5.5]. The guidelines also state: *“The*

value to older adults of activities which improve strength, balance and flexibility cannot be overstated, and therefore receive greater prominence in these revised guidelines” [5.5].

The UK CMO appointed Mutrie to chair a working group of more than ten leading physical activity researchers, including Kelly, to develop recommendations on communicating the 2019 Physical Activity guidelines and monitoring their effectiveness [5.6]. The guidelines called for more comprehensive recommended exercises to help people meet muscle strengthening and balance-promoting activities, based on the researchers’ findings (3.5). The working group’s previous 2018 Surveillance Technical Report [5.7] cited Mutrie, Fitzsimons and Kelly’s work (3.4) to challenge prior analysis that suggested people’s total sedentary time increases with age and argue for improved measures recognising sitting time at work. It also included Kelly’s discovery that differences in reported physical activity between children in Scotland and England could be explained by differences in analysis methods (3.6) among the justifications for its call for greater harmonisation in health research across the UK [5.7].

In a November 2019 letter, a Senior Policy Manager, Physical Activity, UK Department for Health and Social Care, wrote “[Mutrie, Fitzsimons and Kelly’s research] strongly contributed to the focus and final form of the 2019 UK CMOs’ Physical Activity Guidelines. [The] UK is one of the leaders with guidelines for healthcare professionals to help people be more physically active, thanks to the work of [these] researchers” [5.8].

5. Sources to corroborate the impact

5.1 HEAT methods and user guide, citing Kelly’s research 3.1 (reference 10 on page 65 of the report) and 3.2 (reference 62 on page 69 of the report). First published 2014. Updated 2017: http://www.euro.who.int/_data/assets/pdf_file/0010/352963/Heat.pdf

5.2 Letter from Senior Policy and Programme Advisor, WHO

5.3 Letter from Head of Strategy, Active Scotland, Scottish Government

5.4 Letter from Senior Research Officer, Scottish Government

5.5 UK Chief Medical Officers’ Physical Guidelines. Published 7th September 2019, updated 9th January 2020: <https://www.gov.uk/government/publications/physical-activity-guidelines-uk-chief-medical-officers-report>

5.6 UK Physical Activity Guidelines’ Expert Panel Members:
<http://www.bristol.ac.uk/sps/research/projects/physical-activity/expert-working-groups/>

5.7 UK Physical Activity Guidelines surveillance report, May 2018. See p. 7 of the evidence (reference 13 is 3.3), p. 16 (referencing 3.6 while it was in press) and p. 29 (reference 30 is 3.4): <http://www.bristol.ac.uk/sps/research/projects/physical-activity/final-working-group-papers/>

5.8 Letter from Senior Policy Manager, Physical Activity, UK Department for Health and Social Care