

Institution: Brunel University London		
Unit of Assessment: 3 Allied Health Professions, Dentistry, Nursing and Pharmacy		
Title of case study: Informing policies and implementation of interventions to boost physical activity		
Period when the underpinning research was undertaken: 2005 – 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:
Nana Anokye	Reader	09/2006 - present
Julia Fox-Rushby	Professor	12/2004 - 08/2017
Paul Trueman	Professor	01/2010 - 05/2011
Teresa Jones	Research Fellow	06/2004 - 05/2017
Joanne Lord	Senior Research Fellow	09/2008 - 08/2015
Christina Victor	Professor	10/2009 - present
Sabina Sanghera	Research Fellow	08/2014 - 01/2016
Period when the claimed impact occurred: 8/2013 – 12/2020		
Is this case study continued from a case study submitted in 2014? No.		

1. Summary of the impact (indicative maximum 100 words)

Physical activity (PA) contributes to prevention and management of many medical conditions. Brunel's pioneering research programme, especially economic modelling of interventions to boost PA, influenced policies, sometimes directly. The team's policy-relevant research activity played a significant role in guideline development for the National Institute for Health and Care Excellence (NICE), including for several versions of its Public Health (PH) 44 guideline. This covered brief advice in primary care to encourage physical activity, which Brunel's economic modelling showed to be highly cost-effective. NICE and other bodies produced further documents informed by and/or promoting the guidelines, including for physiotherapists. Brunel also used the economic analysis in trials of specific PA interventions (for example, pedometers). Such trials, too, impacted on policy. Additionally, Brunel's research helped create NICE's novel policymaking PA Return on Investment (ROI) tool. Available on the NICE website, this software helped policymakers identify cost-effective PA interventions for their area. The increasing international reach of the PA research improves debate quality, including current work linked directly to Ghana's Presidential policymaking.

2. Underpinning research (indicative maximum 500 words)

Physical activity (PA) contributes to the prevention and management of many medical conditions including coronary heart disease, type 2 diabetes mellitus, osteoporosis, cancers and some mental illnesses. Many ways to increase PA are proposed, but building support for funding interventions is challenging, as is identifying the most cost-effective interventions to promote and adopt. Brunel's policy-relevant pioneering research analysing PA started in 2005 when the Department of Health (DH) agreed with Brunel's Health Economics Research Group (HERG) that a programme of research around the economics of PA interventions to boost health, should be a priority for its DH-funded core grant. This enabled the Brunel team to strengthen its capacity in this field.

In 2009, Anokye and Trueman from Brunel joined a team from Exeter, led by Rod Taylor, in a project funded by the NIHR's Health Technology Assessment (HTA) programme on the clinical effectiveness and cost-effectiveness of exercise referral schemes (ERSs). Brunel led the economic evaluation, as reflected in Anokye's position as first author of papers on cost-effectiveness [Research (R)1] and relations between PA and Health Related Quality of Life (HRQoL) [R2]. For R1 they developed a decision-analytic economic model. They found ERSs are associated with a modest increase in lifetime costs and benefits, but that the cost-effectiveness of ERSs is highly sensitive to small changes in the effectiveness and cost of ERS. It recommended further effectiveness research. The HRQoL paper demonstrated an association between higher levels of PA and better HRQoL, and "uniquely" how these process benefits differ across objective and subjective measures of PA. The findings helped inform assessment of PA

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interventions. The economic analysis was also an important part of the papers reporting the overall findings [R3].

NICE then funded Brunel's Anokye, Fox-Rushby, Lord and Jones to conduct reviews and modelling to inform the development of NICE Guidance PH44 on brief advice in primary care to encourage adults to increase or maintain activity levels. PH44 described the three resulting Brunel published reports and provided hyperlinks to them; the reference for PH44 is in section 5 because this research was directly incorporated into that policy document [Evidence (Ev)1]. The review of economic evaluations found there was insufficient evidence, *"Therefore, a de novo modelling of the cost effectiveness of brief advice was needed to improve knowledge of its efficiency."* Table 1 below shows how the developing research stream was related to two PA topics [each with a subsequent NICE PH guideline shown in square brackets - see section 4 for details], and how the Brunel team re-used the decision analytic model originally developed for the ERS study [R1], in creating the new Markov model. Findings from this new economic modelling were published first as one of the Brunel reports (Anokye et al, 2012), then in a sports medicine journal [R4]. A key claim was the suggestion of there being a 99.9% chance that brief advice *"is a cost-effective way to improve PA among adults, provided short-term mental health gains are considered."*

A further HTA review (commissioned by NICE to seek additional ERS trials to analyse) was mainly conducted by a team from Sheffield, but it included Brunel's Anokye. He used this new systematic review's evidence on ERS effectiveness to update the version of his economic analysis conducted for PH44 (itself an amended version of the one developed by Brunel for the earlier ERS study [R1]). The new study (Campbell, et al, 2015 [R5]) concluded that while there was considerable uncertainty around the cost-effectiveness of ERSs, the analysis indicated that the cost compared with usual care was GBP76,000 per QALY gained – higher than the figure usually funded by NICE.

Table 1: Overlaps in Brunel's stream of policy relevant PA economic modelling research

Exercise Referral Schemes (ERSs) [PH54]	PA: Brief advice in Primary Care [PH44]
2009-10: NIHR-funded HTA project with Exeter; Brunel developed the economic model; <u>Publications include:</u> Anokye et al (2011) - see Research [R]1 below (also R2, R3)	
	2012-13: NICE funded Anokye et al to review the field and build on the economic model they had developed for ERS to create a new model [central to NICE Guideline PH44 (2013/16)]; <u>Publications include:</u> 1) Anokye et al report (2012); 2) Anokye et al (2014) R4
2013-15: NICE-commissioned, NIHR-funded HTA project with Sheffield; it identified more ERSs trials that Brunel used in further economic modelling [for NICE PH54 (2014)]; <u>Publication:</u> Campbell et al (2015) R5	

The Brunel team also applied the Markov modelling to provide economic analysis in trials of specific PA interventions. Examples include a trial of a pedometer-based walking intervention with, and without, practice nurse support in primary care patients. It was led by Tess Harris and others from St George's, University of London. Brunel's Fox-Rushby and Victor were Co-Is, with Brunel leading on the economic paper (Anokye et al, 2018) whose positive long-term cost-effectiveness findings accompanied the main trial papers also co-authored by the Brunel team [R6].

Anokye became Director of Brunel Global Health Academy and, with others from Brunel, continues conducting collaborative policy-relevant PA research with potential users of the findings. In Ghana this involves working with the Office of the President to explore the multi-level

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determinants of obesity through the lenses of multiple lifestyle behaviours, chief among which is PA.

3. References to the research (indicative maximum of six references)

R1: Anokye NK, Trueman P, Green C, Pavey TG, Hillsdon M, Taylor RS. The cost-effectiveness of exercise referral schemes. 2011; *BMC Public Health*; **11**:954. doi:10.1186/1471-2458-11-954 (**R1, 2 and 3** result from the NIHR HTA project 08/72 - GBP153,383)

R2: Anokye NK, Trueman P, Green C, Pavey TG, Taylor RS. Physical activity and health related quality of life. 2012; *BMC Public Health*; **12**:624. doi:10.1186/1471-2458-12-624

R3: Pavey T, Anokye N, Taylor A, Trueman P, Moxham T. The clinical effectiveness and cost-effectiveness of exercise referral schemes: a systematic review and economic evaluation. *Health Technol Assess* 2011; **15**(44) <https://doi.org/10.3310/hta15440>

R4: Anokye NK, Lord J, Fox-Rushby J. Is brief advice in primary care a cost-effective way to promote physical activity? 2014; *Brit J Sport Med*; **48**:202-6. doi: 10.1136/bjsports-2013-092897 The journal is a membership benefit for 25 physiotherapy and other organisations.

R5: Campbell F, Holmes M, Everson-Hock E, Davis S, Buckley Woods H, Anokye N, et al. A systematic review and economic evaluation of exercise referral schemes in primary care: A short report. *Health Technol Assess* 2015; **19**(60) <https://doi.org/10.3310/hta19600> (NIHR HTA project 13/45/01 GBP65,625)

R6: Harris T, Kerry S, Victor C, Iliffe S, Ussher M, Fox-Rushby J, Wincup P, Ekelund U, Furness C, Limb E, Anokye N...Sanghera S, Cook D. A pedometer-based walking intervention in 45- to 75-year-olds, with and without practice nurse support: the PACE-UP three-arm cluster RCT. *Health Technol Assess* 2018; **22**(37) <https://doi.org/10.3310/hta22370> (from NIHR HTA project 10/32/02 – GBP1,266,989; 3/2012-8/2018)

4. Details of the impact (indicative maximum 750 words)

The Brunel team's research made a significant and often rapid impact on NICE guidelines on PA, and through them an impact on various other policies and implementation efforts to promote PA (**Impact 1**). Anokye et al's research played a key role in the production of a novel policy, the NICE Return on Investment (ROI) Tool for PA, that facilitated creation of an improved evidence-base for local health investment decisions (**Impact 2**). The research stream's increasing international reach also informs policies and debates, sometimes during collaborative research (**Impact 3**). The beneficiaries of Brunel's research included policymakers and professionals who had a stronger evidence base for making decisions to invest in, promote and implement PA interventions. This should result in increased PA, and thus, eventually, improved population health, as noted above.

Diverse actions by the team encouraged impact, including through presentations and the media. While the pathways to impact were sometimes direct to relevant audiences, they were also complex and multi-layered, not always following traditional patterns. The DH, as the main policymaking user of cost-effectiveness analysis, was engaged from the outset. It supported Brunel's programme of research explicitly because of its potential usefulness in creating a stronger evidence-base for a major policy area – the pattern is now being repeated in the team's research in Ghana. The research was often conducted for, and sometimes with, DH bodies such as NICE. On occasions, as outlined in Table 1, the co-produced research was incorporated into policy **before** it was published in journal articles. These NICE policies sometimes had increasing reach as they, in turn, informed further policy documents from NICE and others, who's networking also encouraged professionals such as physiotherapists to implement the Brunel-informed NICE guidance.

Impact 1: Contributing to NICE guidelines on Physical Activity (PA) and through them informing further policies, implementation and debates

While the original version of NICE PH44 was published in May 2013, it, and then a later refreshed version, made a significant impact throughout the relevant period since August 2013, not only directly, but also through many subsequent policies and implementation activities based on it. Following a regular guideline Surveillance check in 2016, NICE declared that the 2013 version of PH44 should be re-issued, but be refreshed with additional material (see below). The version included as **Evidence (Ev)1**, is therefore a later version which retains the 2013 wording showing that the Brunel team provided key parts of the evidence on which it was based: "The

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review of economic evaluations and the review of economic barriers and facilitators... and the economic modelling ...were carried out by Brunel University London/Health Economics Research Group (HERG). The principal authors were Anokye N, Jones T and Fox-Rushby J.” (p.58).

The Brunel reviews behind PH44 cited papers **R1** and **R2**, and, as noted, the economic modelling was later also published as **R4**. Informed by this, PH44 stated the provision of brief advice to promote PA in primary care was cost effective and the guidance was relevant for the general public, commissioners and “*exercise professionals, GPs, health trainers, health visitors, mental health professionals, midwives, pharmacists, practice nurses and physiotherapists*” (p.6). This refreshed version of PH44 also stated: “*This guideline is the basis of QS84*” (p.5). That 2015 NICE Quality Standard supported action to encourage PA when people “*are in contact with the NHS*” (p.5) [Ev2]. It listed the organisations that “*agreed to work with NICE to ensure that those commissioning or providing services are made aware of and encouraged to use the quality standard*” (p.44), including the Chartered Society of Physiotherapy and the Royal College of GPs.

NICE promoted PH44 through its website, and drew on it to inform a range of further NICE policies and actions. It drew on PH44 as a key source for its web-based interactive PA pathways which are regularly updated flowcharts of recommendations for boosting PA in diverse circumstances. For example, PH44 was one of only two sources listed for the pathway on *Training for people involved in encouraging others to be physically active* (NICE, updated 2019, p.11) [Ev3]. Additionally, NICE promoted use of PH44 in the *Shared learning database* of its PA website by featuring a 2018 plan for implementing it developed by physiotherapists at Doncaster and Bassetlaw NHS Trust [Ev4].

In 2014, NICE PH54 provided guidance on ERSs [Ev5], which as Table 1 shows was the PA intervention for which Brunel’s economic modelling started. As stated on p.45/6, PH 54 was based on three key sources of evidence. The first consisted of two reviews - one by the team including Anokye was subsequently published as **R5**, but was made available for NICE prior to publication. That review cited **R1** and Anokye et al’s previous reviews for NICE. The second and overlapping source was “*economic modelling*” – this was the economic modelling (conducted by Anokye) contained in publication **R5** that indicted ERSs were unlikely to achieve the cost-effectiveness usually required for an intervention to be recommended by NICE. PH54 drew on the economic evaluation to inform the main recommendations that primary care practitioners should only refer people to ERSs in limited circumstances. PH54 became a source for some NICE PA pathways.

PH54 was also cited along with PH44 as a source in policy documents from diverse other national and local bodies. These included Public Health England (PHE) in their 2017 *NHS Health Check: Best Practice Guidance* (p.35) [Ev6] and, with calls for implementation of both the guidelines, in the 2015 *Hertfordshire Physical Activity and Sport Framework* created by Hertfordshire County Council, its 10 District Councils and various bodies in a multi-agency approach (p.5,49) [Ev7].

Findings from the pedometer trial [R6] were rapidly examined by NICE to see if policy updating was required. The report, *2019 Exceptional Surveillance of physical activity: walking and cycling (NICE guideline PH41)*, concluded that this major trial reinforced rather than conflicted with current advice (p.3) [Ev8]; therefore, the impact here was to strengthen rather than change existing policy.

Impact 2: Helping NICE produce their Physical Activity Return on Investment (ROI) tool

Brunel’s research was central to the development of the NICE PA ROI tool. This was a new type of policy approach. The tool’s software (and accompanying Technical Report) were available and promoted on the NICE website. They could be used by commissioners of local services to estimate the cost-effectiveness of different packages of PA interventions given the known population and current PA levels in their area. The significant role of Brunel’s research was explained in the tool’s Technical Report, dated May 2014 and produced by Matrix. This repeatedly described how the tool drew on the research, in particular the Markov model (as described in publications shown on Table 1, including the eventual **R4**). One example stated:

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“The economic model used in this tool is based on the Markov model developed by Anokye et al (2012) for the NICE Public Health Intervention Guidance on Physical Activity.” (p.9) [Ev9].

The significance of Brunel’s research on the economic assessment of interventions to promote PA was also highlighted in June 2014 in NICE’s press release launching the ROI tool for PA [Ev10]. It highlighted the direct policy impact of Brunel’s research in creating NICE tools, and through that further impacts on local policymakers as the tools *“help councils predict the health benefits for communities - and the money they could save – when they invest in activity...The NICE return on investment tools have been developed in collaboration with Brunel University, LeLan Solutions and Matrix Knowledge.”* The press release also quoted PHE’s Dr Varney: *“The tool will be invaluable to local authorities who wish to commission cost-effective services and interventions that help to get more people more active more often”* [Ev10]. NICE, other bodies and local authorities all used or promoted the tool, for example those supporting Hertfordshire’s PA framework noted above (p.19) [Ev7]. In a 2014 policy initiative, *Everybody Active, Every Day*, PHE stated it had: *“developed a summary of the tools (including the NICE return-on-investment tool)”³⁶ that make the case for investment, and of the guidance on what local authorities and commissioners can do”* (p.8) [Ev11].

Impact 3: Informing policies and debates internationally to promote Physical Activity

A 2016 position statement by the Canadian Academy of Sport and Exercise Medicine cited **R4** as one of only two references for a prominent opening claim highlighting *“the cost-effectiveness of exercise prescription in primary care”* (second para), however briefly done [Ev12]. This position statement, published in two leading journals, has been endorsed by ten sport medicine societies, including: the Australasian College of Sports and Exercise Physicians, American Medical Society for Sports Medicine, European College of Sport & Exercise Physicians, South African Sports Medicine Association, and Swedish Society of Exercise and Sports Medicine.

Brunel’s ongoing PA research has improved the quality of debate around boosting PA. The research under way in Ghana is under the auspices of the Office of the President whose letter to Anokye corroborating the emerging impact stated it is being: *“conducted to inform Ghanaian health policy to reduce obesity. I believe that the team built on the Brunel expertise in reviewing the evidence, especially on physical activity to outline key areas that needed attention. ...Through the activities of research, stakeholder engagement and consensus building I believe your work is already informing the policy debate in Ghana about tackling obesity.”* [Ev13]

5. Sources to corroborate the impact (indicative maximum of 10 references)

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- Ev1:** NICE Guideline PH44, refreshed in 2016: *Physical activity: brief advice for adults in primary care*; Brunel’s research was one of the main sources; pdf submitted [Impact (Imp)1]
- Ev2:** NICE Quality Standard (QS84) for PA, 2015: *Physical activity: for NHS staff, patients and careers*; based on PH44 and other sources; pdf submitted [Imp1]
- Ev3:** NICE Physical Activity Pathway, updated 2019: *Training for people involved in encouraging others to be physically active*; PH44 listed as one of two sources; pdf submitted [Imp1]
- Ev4:** NICE PA website: *Shared learning database*; physiotherapists applying PH44; pdf [Imp1]
- Ev5:** NICE Guideline PH54, 2014: *Physical Activity: exercise referral schemes*; pdf [Imp1]
- Ev6:** PHE, 2017: *NHS Health Check: Best Practice Guidance*; cites PH44 & 54; pdf [Imp1]
- Ev7:** Hertfordshire, 2015: *Hertfordshire Physical Activity and Sport Framework*; pdf [Imp1 & 2]
- Ev8:** NICE: 2019 *Exceptional Surveillance of physical activity: walking and cycling (NICE guideline PH41)*; concluded the research in **R6** reinforced policies in PH41; pdf submitted [Imp1]
- Ev9:** NICE’s 2014 PA ROI tool’s Technical Report (produced by Matrix): *Estimating Return on Investment for interventions and strategies to increase physical activity*; (see p.9); pdf [Imp2]
- Ev10:** NICE press release, June 2014: *NICE produces interactive tools to help local authorities improve people’s health and save money*; shows role of Brunel’s research & ROI tools; pdf [Imp2]
- Ev11:** PHE, 2014: *Everybody active every day*; shows value of PA ROI tool; pdf submitted [Imp2]
- Ev12:** Canadian Academy of Sport and Exercise Medicine, 2016: *Physical activity prescription: a critical opportunity to address a modifiable risk factor for the prevention and management of chronic disease: a position statement*; **R4** was cited as a key early source; pdf submitted [Imp 3]
- Ev13:** A testimonial from the Office of President of Ghana corroborates policy impact; pdf [Imp 3]