Institution: Liverpool John Moores University		
Unit of Assessment: 24		
Title of case study: Creating and supporting a "Global Active City" Movement		
Period when the underpinning research was undertaken: 2000-2020		
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:**
Lynne Boddy	Reader & PAEx Lead	2004- to date
Zoe Knowles	Professor	1998- to date
Keith George	Professor	2002- to date
Lawrence Foweather	Reader	2008-2014 and 2016- to date
Lee Graves	Lecturer/Senior Lecturer	2010- to date
Paula Watson	Lecturer/Senior Lecturer	2005- to date
Stuart Fairclough	Professor	2001-2014
Gareth Stratton	Professor	1990-2012
Period when the claimed impact occurred: 2015-2020		
Is this case study continued from a case study submitted in 2014? N		

1. Summary of the impact

Physical inactivity and urbanisation are global public health concerns. The Physical Activity Exchange (PAEx) has completed surveillance, intervention and evaluation research related to physical activity (PA) for over 25 years. This has been translated into a Global Active City (GAC) movement with international reach through; (1) project certification standards, (2) change in knowledge, policy and programmes within pilot project cities (5.8 million residents), (3) increases in PA in the participating cities. These changes have led to reductions in inactivity and demonstrated substantial associated economic benefits with Liverpool, for example, one of the 7 accredited GACs reducing inactivity from 27.4% in 2015 to 23.5% in 2018.

2. Underpinning research

The PAEx has produced >300 peer-reviewed articles between 2000-2020. This body of work includes evidence that has made a distinct and material difference by directly influencing policy and practice within Liverpool, where our research was integral to the novel Liverpool Active City programme (LAC, 2005-present) and globally via the Global Active City project (GAC, 2015-present). The GAC project was purposefully modelled on the LAC, where PAEx research informed policy (e.g., SportsLinx) and evaluated actions (e.g., Active Play, A-CLASS). This research has been used throughout the set-up and running of the GAC project.

The information below details three research themes, that embody PAEx research that has prompted change and has driven and influenced the developments both within GAC and LAC for creating this world-wide movement.

Surveillance: Liverpool City Council originally engaged PAEx staff to develop a robust talent ID sports pathway, but this timing corresponded with concerns around child health in the city. The SportsLinx project evolved into health surveillance research in 1998. This programme of work produced >40 peer-reviewed research studies including the specific example output by Boddy et al. (2010). Novel data from this long-term study (14 years) in >65,000 schoolchildren revealed significant increases in childhood obesity, changes in food intake and significant reductions in other aspects of health, including cardiorespiratory fitness. This was the first data of this nature in the UK and was directly fed back into Liverpool City Council and the LAC programme as well as the GAC project. By demonstrating areas of inequality this changed resource allocation and policy decisions.

Physical activity interventions and evaluation: A key area of PAEx research is the co-production of theory-based interventions and robust evaluation. The PAEx has conducted a range of interventions, including weight management programmes, school-based projects and workplace health programmes. One example of our evaluation research is Active Play. Evidence from SportsLinx highlighted the need to promote PA, in particular during the early years. Active Play was funded by LAC to evaluate a PA intervention in pre-school children. Findings from this work published in O'Dwyer et al. (2012) described post-intervention improvements in sedentary time

and total PA. This evidence was part of the formal LAC evaluation and informed service/resource allocation and has been used in GAC activity.

Another example intervention and evaluation research programme has focussed on workplace health. Desk based workers spend the majority of their time sitting. Graves et al. (2015) conducted an RCT to evaluate the effectiveness of using height-adjustable workstations to reduce sitting time in office workers. The study described significant declines in sitting time and total cholesterol and increases in standing time in the intervention group. This research provided evidence of the utility of workplace interventions and potentially effective ways to improve health for organisations, employers and public health professionals within an urban office setting and is applicable globally.

Physical activity measurement: A key PAEx research area that underpinned the GAC programme is PA measurement and the use of novel methods to understand PA behaviours. One key research programme explored children's out of school PA as an under-researched area of the literature and key area to target for PA interventions. Noonan et al. (2016) detailed a novel method to examine children's PA behaviours and perceptions using the 'Write, Draw, Show and Tell' approach. This method has been widely cited and employed in practice, providing a way to involve the child's 'voice' within projects and evaluations, gaining rich insight into preferences, perceptions and PA behaviours.

Technical issues are challenging when attempting to measure PA using devices such as accelerometers. Methodological advances regarding device-based assessments of PA is a key area of PAEx research that has been used within GAC. In particular, raw accelerometer data processing offers greater comparability between studies and improved researcher flexibility/control over decision making. The Fairclough et al. (2016) study was the first to examine counts vs raw accelerometer metrics and two monitor placement sites in children. The study showed significant differences in PA levels according to raw and counts based processing from hip and wrist monitors. This study also highlighted significant differences in compliance. This evidence has been widely used and has been integrated into a range of training GAC workshops.

Whilst accelerometers in theory provide device-based assessments of PA, they are expensive and require technical expertise. Self-reported tools represent a feasible method of estimating PA on a population level but are susceptible to bias. Fairclough et al. (2019) detailed the calibration (against device-based measures) and validation of the Youth Physical Activity Profile for use in the England. This provides a more accurate self-report tool to assess physical activity in youth on a population level. This work has been integrated into PA monitoring training and underpinned the successful funding application for work with the city of Buenos Aires.

3. References to the research

The research programmes and the six key outputs described in Section 2 that underpinned the impact are shown below. All outputs have been through a rigorous peer review process and are published in some of the main and established international journals in this field. Substantial elements of this work were funded by external funders (e.g., SportsLinx, Active Play). Authors highlighted in bold font were based within PAEx/LJMU during data collection):

1. **Boddy LM, Hackett AF, Stratton G.** (2010) Changes in fitness, body mass index and obesity in 9–10-year-olds. *Journal of Human Nutrition and Dietetics*, 23(3): 254-259.
2. **O'Dwyer M, Fairclough SJ, Knowles ZR, Stratton G.** (2012). Effect of a family focused active play intervention on sedentary time and physical activity in preschool children. *International Journal of Behavioral Nutrition and Physical Activity*, 9, 117.
3. **Graves LEF, Murphy RC, Shepherd SO, Cabot J, Hopkins ND.** (2015). Evaluation of sit-stand workstations in an office setting: A randomised controlled trial, *BMC Public Heal*th, 15, 1145.
4. **Noonan RJ, Boddy LM,** Fairclough SJ, **Knowles ZR.** (2016) Write, draw, show, and tell: a child-centred dual methodology to explore perceptions of out-of-school physical activity. *BMC Public Health*. 16: 19.
5. **Fairclough SJ, Noonan R,** Rowlands AV, Van Hees V, **Knowles ZR, Boddy LM.** (2016). Wear time compliance and activity in children wearing wrist and hip mounted accelerometers. *Medicine and Science in Sports and Exercise*, 48(2): 245-253.

6. Fairclough SJ, Christian DL, Saint-Maurice PF, Hibbing PR, Noonan RJ, Welk GJ, Dixon PM, **Boddy LM.** (2019) Calibration and validation of the Youth Activity Profile as a physical activity and sedentary behaviour surveillance tool for English youth. *International Journal of Environmental Research and Public Health*, 16(19): 3711.

Details of Funding (funding information relates specifically to relevant projects outlined above):

- Stratton (1998-2013, (Boddy 2012-2013)), SportsLinx and Liverpool Active City funding, Liverpool City Council. Total value = £1.45 million.
- Knowles, (2011-2015) Active Play funding, Liverpool City Council. Total value = £48,789.

4. Details of the impact

The PAEx have a strategic approach to translation with evidence disseminated locally to project partners, to policy makers within the Local Authority and NHS as well as more broadly via international conferences, journal articles and published reports. We are able to disseminate directly into LCC via formal Board roles and the GAC project as the Academic Partner alongside The Association for International Sport for All (TAFISA), Evaleo (a non-profit sustainable health organisation) and the International Olympic Committee (IOC). Evidence of change, including its significance and reach are outlined below, and the process, beneficiaries and nature of the impact are explained.

Process and pathways to Impact: PAEx projects and outputs underpinned and evaluated the Liverpool Active City strategy (LAC, 2005-present, **[EV1]**, REFERENCES 1-4). Our work with LAC led directly to PAEx supporting collaborative programme delivery with TAFISA (e.g., Triple AC, 2012-present **[EV2]**). This relationship was the precursor to the Global Active City project (GAC, 2015-present) which is purposefully modelled on LAC. In 2015, as the **academic partner for GAC**, PAEx staff **Boddy**, **Knowles** and **George** were appointed as Expert Advisors **[EV3]** to provide continuous input to the project (2015- to present). Marsden, jointly funded by LJMU and GAC, was appointed as the **Director of the GAC** development programme and continues as an International Active City Advocacy and Development Officer at LJMU working in tandem with TAFISA. These staff, their expertise and organisational roles that informed and influenced developments provide a **clear and direct link** between our research and the GAC initiative as well as the cities and organisations involved in the GAC project. For example, the GAC project involves an introductory workshop, a diagnostic visit/report, the formation of a Physical Activity and Sport for All alliance (PASA) and strategy, and an independent audit. PAEx research was integrated into, shaped and supported delivery in all stages of this process. In the audit each city must meet an ISO compatible standard to achieve GAC status. PAEx research was used as underpinning evidence during the development of the ISO compatible standard and provided illustrative case studies for cities to inform their own research/evaluation plans (directly linked to REFERENCES 1-6). For example, Boddy, Knowles and George provided direct feedback on all iterations of the ISO compatible standards (2016), attended 2 expert meetings and the 2016 final consultation event when standards were finalised **[EV4]**.

The PAEx delivers expert advice and support to GAC candidate cities (involving municipal representatives, academics, clinicians/health practitioners) on a bespoke basis, including leading workshops that utilise PAEx research throughout. During the GAC project (2016-to date), our research was used to highlight the importance of PA promotion and explain methods used to conduct health surveillance (REFERENCE 1 **EV5**), support cities in identifying KPIs and how to evaluate interventions (REFERENCES 1-3, **EV5**, **EV6**), and integrated within PA measurement training central to the work with Buenos Aires (REFERENCES 4-6, **EV5**). Research was integrated within 2 introductory workshops, 11 training workshops, 10 diagnostic visits and reports, 7 conferences/congresses, and written documents including case studies. The diagnostic report for Havana, Cuba is presented as an example and directly refers to PAEx research (REFERENCE 3 and SportsLinx, **EV7**) as part of the guidance for the development of evaluation processes.

Since Buenos Aires gained GAC accreditation status in 2018, PAEx have continued to work closely with relevant teams in the city to further develop their research/evaluation strategy. One

Buenos Aires city government delegate attended a workshop on evidence-based practice in Liverpool in 2018. Following the success of that workshop we hosted six delegates at LJMU (3 x government employees, 3 x academics) to provide bespoke training on PA measurement and evaluation in May 2019. In **EV5** Buenos Aires staff reflect on the impact of specific PAEx research (REFERENCE 6) in this process. In 2019 we submitted a successful collaborative research funding proposal and data collection was due to commence in March 2020. This has been suspended during the Covid-19 pandemic but is now planned for September 2021.

Beneficiaries: For the certification process all candidate GAC cities receive the ISO standards and accompanying documents (total to date=21). In the pilot/development project, **7 cities across 7 countries** were successfully certified as GACs in 2018. From the initial introductory meetings held in 2016, cities established a multi-sector PASA Alliance and developed a PASA strategy to meet the accreditation requirements. As an example, Buenos Aires provide testimony **[EV5]** that their work was informed by PAEx research (REFERENCES 1,3,6) and led to the development of an Alliance that includes over 40 organisations spanning government, universities, professional sports clubs, charities, healthcare providers and industrial partners **[EV5]**. Therefore, a wide range of organisations and individuals are beneficiaries of the certification process.

The beneficiaries of the impact of GAC currently include **over 5.8 million citizens** from the original 7 certified cities. The professionals in each city involved in the GAC process also benefit in terms of knowledge, expertise and potential career enhancement. **Direct change** has occurred for city professionals and citizens. For the specific example of Buenos Aires, LJMU, Univiersidad Favaloro and the City Government of Buenos Aires signed letters of intent in 2019 to continue long-term collaborative work around PA, cardiovascular health and the sport and exercise sciences **[EV5]**.

Partner organisations are beneficiaries as well. LJMU was acknowledged in 2020 with the award of the **TAFISA Mission 2030 Academia Award** on the basis of contribution to the GAC programme: *'Their [LJMU] openness and readiness to share their expertise with the world, and train other stakeholders, universities and cities worldwide to promote physical activity make them a logical recipient of the award'*. **[EV2, EV8a]**. TAFISA has identified Active Cities as key theme in the TAFISA Mission 2030 and has thus changed its policy focus **[EV8b, c]**.

Nature and extent of impact: All accredited GACs have developed the necessary systems and policies to satisfy accreditation requirements designed to promote PASA for all of their citizens. This includes the PASA alliance, **active city policies [EV9]**, mass participation events, and PA programmes. Therefore, the certification process and associated changes at the municipal level have impacted upon **society**, **public policy** and **services** and the **sport sector**. Immediate impacts include employment opportunities within the PASA or organisations (e.g., 2 new full-time jobs in Buenos Aires, Argentina, **[EV5]**) thus **benefitting the economy** and changes to funding structures (e.g., the budget for the Sports Department was raised from € 3.2 million to 4 million in Graz, [partner city] **[EV6]**).

The GAC process and city-specific work has resulted in the **promotion of PA opportunities**, for example through **policies** and **environmental changes** (e.g., new walking routes in Lausanne, **[EV6, EV8d]** and 'radical' urban planning initiatives in Hamburg **[EV8e]**). Post workshop feedback has also described the positive impact of PAEx research on cities, for example feedback from Lausanne: *'The evidence presented (REFERENCES 1-6) have helped to demonstrate the importance to act in the field of PASA at a local level'* **[EV6]**.

The GAC certified city of Liverpool provides evidence of **longer-term change** of the Active City model by demonstrating **reduced levels of inactivity** (27.4% in 2015 to 23.5% in 2018) thus benefitting **health**, **increased economic benefits associated with health** (from £417.9 million in 2015 to £456 million in 2018) and **increases in the total economic value of sport** (£157.6 million in 2015 to £226.8 million in 2018) **[EV10]**. Liverpool is one of 7 certified cities therefore the **long-term** cumulative **educational**, **environmental**, **economic** and **health impacts** of GAC are likely to be substantial and demonstrates the **extensive** and **worldwide reach** of this impact.

5. Sources to corroborate the impact

1. Testimonial/Letter of Support: Liverpool Active City Lead Officer. This outlines the collaborative work between LAC and the PAEx, and highlights some of the key projects/programmes that have informed LAC since 2005. This includes the projects referred to in references 1-4 and also mentions reference 1 specifically.
2. Testimonial/letter of support from the Secretary-General of TAFISA, explaining the role of the PAEx research (including references, 1, 2, 4) and the Expert Advisors. The letter also highlights some of the Triple AC work and new cities involved in GAC moving forward.
3. Expert Advisor invitation and example ISO Compatible Standards review request email. This provides an example of the Expert Advisor invitation and an email to one of the Expert Advisors regarding the ISO Compatible Standards consultation/development. (confidential)
4. ISO compatible standards development: An example feedback form has been included to demonstrate some of the contributions of Boddy, Knowles and George to the standards development process. The final ISO compatible standards are also included (confidential).
5. Testimonial/letter of support Buenos Aires Citizenship Development Secretary's Chief of Staff. This letter describes: the importance of PAEx research (specifically referring to references 1, 3, 6), the nature of the PASA established including 2 new full-time posts and the collaborative now planned to start in September 2021.
6. Survey responses from Graz (Partner City) and Lausanne (certified GAC) (confidential). GACs and Partner Cities (cities that are working towards certification) were asked to complete a feedback survey. The responses from Graz and Lausanne are provided as examples.
7. Example Diagnostic Report for Havana, Cuba (Confidential). This report details the observations made on the diagnostic visit to Havana, and the recommendations from the GAC provided to the city. This report includes references to PAEx research including two specific references (reference 3, and other evidence from the SportsLinx project).
8. Website and medial articles/links: a) a link to the TAFISA Mission 2030 awards page b) the TAFISA GAC page that highlights the PAEx in several areas, c) TAFISA Mission 2030 information page, d) an interview with the Lead Project Officer, Physical Activity Strategy from Lausanne e) a news article publicising new urban planning initiatives in Hamburg (a GAC), **f**) Link to a Richmond Active City YouTube video.
9. The City of Richmond Community Wellness Strategy 2018-2023. This outlines a substantial wellness strategy. In section 2.1 the strategy highlights the GAC and that the city is *'leading the movement to improve the lives of their citizens through the promotion of PA, sport healthy lifestyles, social connections, healthy built and natural environments, and well-being for all.'*
10. Economic evaluation of Liverpool Active City 2015-2018. This independent report produced by Amion Consulting, was commissioned to examine the economic impact of changes in physical activity behaviours observed in Liverpool. The report was commissioned in March 2020 and conducted using the most recent data at that time (2018/2019). The report details the economic benefits associated with reduced physical inactivity and increases in employment and revenue the sport/physical activity sector.