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1 **From one pandemic to another: lessons emerging from COVID-19 for tackling physical**
2 **inactivity in cities?**

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22 **Abstract**

23 Physical inactivity is a global pandemic. The COVID-19 crisis has altered global patterns of physical
24 activity in ways that were unimaginable before the outbreak. Enforced restrictions on mobility and the
25 mass closure of indoor fitness centres has highlighted the limitations of many urban areas for physical
26 activity and inequalities in physical activity opportunities across cities. However, unprecedented
27 reductions in mobility and increases in localised physical activity provide unique insight on
28 opportunities for urban health promotion. COVID-19 responses can therefore, encourage new
29 perspectives in urban planning and inspire novel future strategies to design more sustainable, healthier
30 and equitable cities.

31

32 Physical inactivity is one of the leading risk factors for global morbidity and mortality and has been
33 described as a world-wide health pandemic with extensive economic, environmental, and social
34 consequences (Kohl et al., 2012). Regular physical activity offers a variety of benefits for mental and
35 physical health and contributes to the prevention of communicable diseases, such as viral and
36 bacterial infections, and noncommunicable diseases (NCDs), such as diabetes and coronary heart
37 disease. The World Health Organisation (WHO) has a target of reducing global physical inactivity by
38 10 % by 2025; however, this target will likely be missed as rates of inactivity continue to rise in many
39 high-income countries (Guthold et al., 2018).

40 The outbreak of Coronavirus Disease-19 (COVID-19) and the public health measures put in place to
41 curb its transmission have rapidly and radically altered global patterns of physical activity.
42 Restrictions on mobility and the mass closure of indoor fitness centres have localised opportunities for
43 physical activity, by only permitting outdoor exercise in the immediate neighbourhood. Yet even with
44 these restrictions in place, physical activity can play a key role in mitigating the health challenges
45 presented by COVID-19 and the physical and mental health side effects of the control measures
46 designed to decrease the spread of the virus. Physical inactivity and COVID-19 are, therefore,
47 inextricably linked and city policy-makers should address these public challenges synergistically in
48 order to generate a positive legacy from the COVID-19 crisis. This commentary seeks to establish
49 emerging opportunities, insights and research questions related to the impact of COVID-19 on
50 physical activity patterns and inequalities in opportunities for physical activity in cities.

51 It is well established that significant life events can prompt major changes to physical activity patterns
52 (Engberg et al., 2012) and the COVID-19 crisis will likely have multi-directional effects on physical
53 activity levels in cities. For some, behaviours of recreational physical activity, such as organised sport
54 or the use of indoor fitness centres have been disrupted. The loss of employment and shift towards
55 home-working mean reductions in physical activity from active travel for some, whilst for others
56 home-working may provide a chance to increase active lifestyle choices. Additionally, government
57 promotion of daily exercise to avoid the unintended health consequences of COVID-19 mitigation

58 measures may encourage more active behaviours. Substantial variations in lifestyle are changing
59 individual capabilities and opportunities for physical activity in cities and understanding these
60 changes and their lasting effect gives rise to a number of important policy-relevant research questions.
61 Indeed, the emerging research questions and public health challenges are three-fold: (i) how can
62 healthy activity habits and practices that have been disrupted by COVID-19 be re-established (ii)
63 where this is not possible, can alternative opportunities be identified and facilitated to minimise
64 physical inactivity; and (iii) what can be done to support the continuation of positive changes to
65 physical activity that have been developed as a result of COVID-19 interventions?

66 As COVID-19 induces multi-directional effects on global physical activity patterns, existing
67 inequalities in physical activity opportunities are being reinforced and new inequalities are emerging.
68 Participation in physical activity is often greater in neighbourhoods with lower reported crime, more
69 green, blue and open space and better walkability, although these characteristics vary significantly
70 among neighbourhoods (Wolch, Byrne and Newell, 2014). Restrictions on mobility reinforce
71 differences in neighbourhood characteristics and inequalities in the ability of neighbourhoods to
72 support physical activity are, therefore, more apparent than ever. These reinforced inequalities mean
73 that experiences of restricted mobility or ‘lockdown’ will vary substantially among urban populations.
74 There could be considerable benefit to public health throughout and beyond the COVID-19 pandemic
75 if city governments recognise these differences and identify opportunities to reduce area-level
76 inequalities e.g. by permitting access to semi-private green space or implementing temporary
77 pedestrianisation. Such interventions can be particularly beneficial in neighbourhoods with an absence
78 of characteristics that support physical activity, such as those with insufficient green or open space
79 provision and poor walkability and active travel infrastructure.

80 The potential for COVID-19 mitigation to reinforce inequalities in physical activity opportunities
81 extends beyond the built environment and may occur through the economic and social systems of
82 cities. As such, effective short and long-term mitigation strategies must be viewed through the lens of
83 gender, age and deprivation to avoid increasing disparities in physical activity opportunities that are
84 often present in high income countries (Althoff et al., 2017). For example, the widespread closure of

85 schools and shifts towards digital schooling eliminates an important resource for adolescent physical
86 activity. Whilst, in some cultures, there are issues related to the cultural acceptance of women
87 exercising in public spaces and these issues may be reinforced by the closure of indoor or gender-
88 specific fitness centres. Collectively, these concerns highlight a critical research question: what are the
89 short and long-term inequalities for physical activity opportunities emerging from COVID-19
90 responses and what adaptive and mitigate measures can be introduced to limit their effect?

91 Whilst COVID-19 generates many challenges for physical inactivity, the pandemic offers the
92 possibility to think, design and plan more radically to improve opportunities for physical activity in
93 cities and reduce inequalities in physical activity opportunities across neighbourhoods. Mobility
94 restrictions as a consequence of COVID-19 have caused substantial reductions in traffic flow and
95 improvements in air quality in cities making many urban areas more suitable for physical activity than
96 before the outbreak. Moreover, cities across the world are implementing temporary or “pop up” cycle
97 infrastructure and pedestrianisation to alleviate motorised transport dominance, thus increasing public
98 space and enabling safe exercise and active travel. Responses to COVID-19 have therefore, shown
99 that reorganising public space in cities to promote physical activity and reducing barriers to physical
100 activity, such as motorised transport, is both possible and effective. Future research should seek to
101 understand the feasibility of sustaining (or partly sustaining) these strategies in post COVID-19 policy
102 trajectories to ensure positive effects for physical activity in cities. Identifying and prioritising
103 locations where temporary reorganisations of space are most effective in terms of increases in
104 physical activity participation and most valuable in overcoming insufficient opportunities for physical
105 activity and neighbourhood inequalities represent key research avenues for investigation.
106 Furthermore, research that seeks to quantify the effects of reorganising public space on physical
107 activity patterns and barriers to physical activity among different demographic groups that is based on
108 empirical data rather than anecdotal evidence will be particularly valuable to inform future city
109 planning and policy decisions. Personal Global Positioning Systems (GPSs) such as mobile fitness
110 tracking applications and fitness wearables offer a valuable data source to quantify physical activity
111 patterns in temporary spaces and underpin future policy.

112 Opportunities for innovative physical activity planning and remediating neighbourhood inequalities
113 can also gain inspiration from the ‘home-workout’ movement which has been catalysed by global
114 recommendations of household confinement. This new exercise trend, supported by international
115 governments, sports stars and celebrities, has seen everyday household spaces in cities across the
116 world reimaged, as furniture becomes temporary fitness equipment and living spaces become
117 multifunctional. Home-workouts challenge conceptions of ‘normal’ behaviour in everyday spaces and
118 exploring the transferability of this process for city infrastructure and outdoor public spaces may offer
119 potential to overcome the limitations of many urban environments for facilitating physical activity.
120 Rethinking the public realm for physical activity and reimagining urban public space is common for
121 children and many subgroups of society including skateboarders and those who partake in free-
122 running (parkour). However, urban governance often deters such behaviour by ‘designing-out’
123 processes or by legislating against it due to associations with nuisance or crime. Indeed, unlike
124 privately owned household spaces, without effective management multifunctional public spaces can
125 cause conflict among different users groups (Ioja et al., 2014). However, the adoption of inclusive
126 urban planning and management approaches (Fig.1), rather than preventative design strategies, can
127 encourage a more collaborative approach between multiple stakeholders and users groups to create
128 multifunctional urban infrastructure and (re)design public space to encourage and enable physical
129 activity. As cities densify, the benefits of multifunctional infrastructure and public space is becoming
130 increasingly apparent, particularly in neighbourhoods with limited resources. Harnessing insights
131 from the developing home-work out movement, such as collaborating with key individuals and
132 organisations that facilitate and design home-work outs and developing case studies of innovative
133 exercise routines and novel uses of everyday space, highlights an opportunity to radically re-think the
134 public realm as a resource for physical activity and a novel area of future research.

135 The COVID-19 crisis has changed physical activity patterns in cities in ways that were unimaginable
136 before the outbreak and inequalities in physical activity opportunities among neighbourhoods have
137 been reinforced, whilst new inequalities are emerging. We, therefore, truly unique opportunity to
138 critically review our urban environments and their ability to support and enable physical activity.

139 Thus, addressing physical inactivity and COVID-19 synergistically offers scope to generate a positive
140 legacy from the crisis. Clearly, a new wave of public health thinking based upon preventing ill-health
141 is required to remediate COVID-19 and to ensure cities are more resilient to future infectious disease
142 outbreaks. However as concepts such a ‘social distancing’ become embedded in the global public
143 health lexicon, we must not lose sight of other public health challenges including physical inactivity
144 and neighbourhood inequality and ensure that cities are not just places of ill-health prevention, but
145 places of health promotion. For some, as post COVID-19 normalities begin to emerge and restrictions
146 on travel are reduced, opportunities for physical activity beyond their own neighbourhood will
147 resume. For more vulnerable members of society with limited mobility, such as children, the elderly
148 and those without the physical or economic means to travel, the neighbourhood remains crucial for
149 physical activity. As normality returns, our collective experience of the geographies of some of the
150 most vulnerable in society should be used as a valuable reminder that to create more sustainable,
151 healthier and equitable cities, we must enable physical activity for all.

152

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156 **Figure**



157

158 **Fig. 1: Riverside Museum, Glasgow, Scotland.** A co-design process involving local authorities and
 159 skateboarders enabled the creation of a multifunctional shared urban space. Subtle design features
 160 make the area almost unrecognisable as a designated skating location thus catering to the needs of
 161 skateboarders, who sought “street like” features and members of the public and museum visitors by
 162 providing an open space that is suitable for play, socialising and physical activity.

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