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The Lancet

DOI:
10.1016/S0140-6736(18)32884-8

Published: 22/11/2018

Peer reviewed version

[Lynch 18-03967]

Economic and modelling techniques used to value the health benefits of engaging in physical activity in green and blue spaces: a systematic review

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Abstract

Background Many environmental initiatives to improve the physical and mental health of the public are now being evaluated to determine the extent of their effect on quality of life and cost to public commissioners and decision makers. The aim of this systematic review was to investigate the econometric techniques and modelling used to estimate the value of the health benefits of engagement in physical activity in green and blue spaces.

Methods Following PRISMA guidelines, a systematic literature review protocol was developed. The Cochrane Database and Library, PsycINFO, PubMed, Web of Science, ASSIA, CINAHL, DARE, and EED were searched for articles published between Jan 1, 1998, and Feb 16, 2018 (see appendix for search terms and inclusion and exclusion criteria). Article screening of titles, abstracts, and full texts was conducted by three independent reviewers to minimise bias and ensure rigour. All papers meeting the criteria were critically appraised for methodological quality by two independent researchers with a Critical Appraisal Skills Programme checklist. After data extraction, descriptive thematic analysis was conducted and synthesised to answer the research question: what modelling techniques have been implemented to investigate the value of the health benefits of nature-based interventions? Systematic review protocol: PROSPERO registration number is: CRD42018103155

Findings Of 6130 articles retrieved, six met the inclusion criteria. The evidence was critically appraised under two themes: stated preference methods and economic outcome. Evidence synthesis of the econometric techniques and modelling indicated that stated preference techniques and modelling captured preference heterogeneity and provided insights on the effects of the impact of different policy options on engagement in physical activity in green and blue spaces and on the publics' value estimates such as willingness to pay.

Interpretation Stated preference techniques are proficient econometric approaches to capture the use, welfare effects, and benefits transfer value associated with recreational activities in green and blue spaces. Estimates of willingness to pay reflect the public perceived health benefits associated with participation in leisure time activities; the public are willing to pay to gain health benefits but are not willing to relinquish the experience.

Economic results indicate that access to leisure pursuits in green spaces even in urban environments can have physical and mental health benefits, improved health behaviours, and facilitate greater social cohesion.

Funding None.

Contributors

ML, VE, and LHS contributed to the protocol development; data extraction; article screening of titles, abstracts, and full texts; and data synthesis. RTE developed the research concept and reviewed drafts of the abstract. ML and LHS did the Critical Appraisal Skills Programme Checklist.

Declaration of interests

We declare no competing interests**.**

Items for Systematic Reviews and Meta-Analysis (PRISMA) (Moher et al., 2015) the flowchart diagram is shown in figure 1.

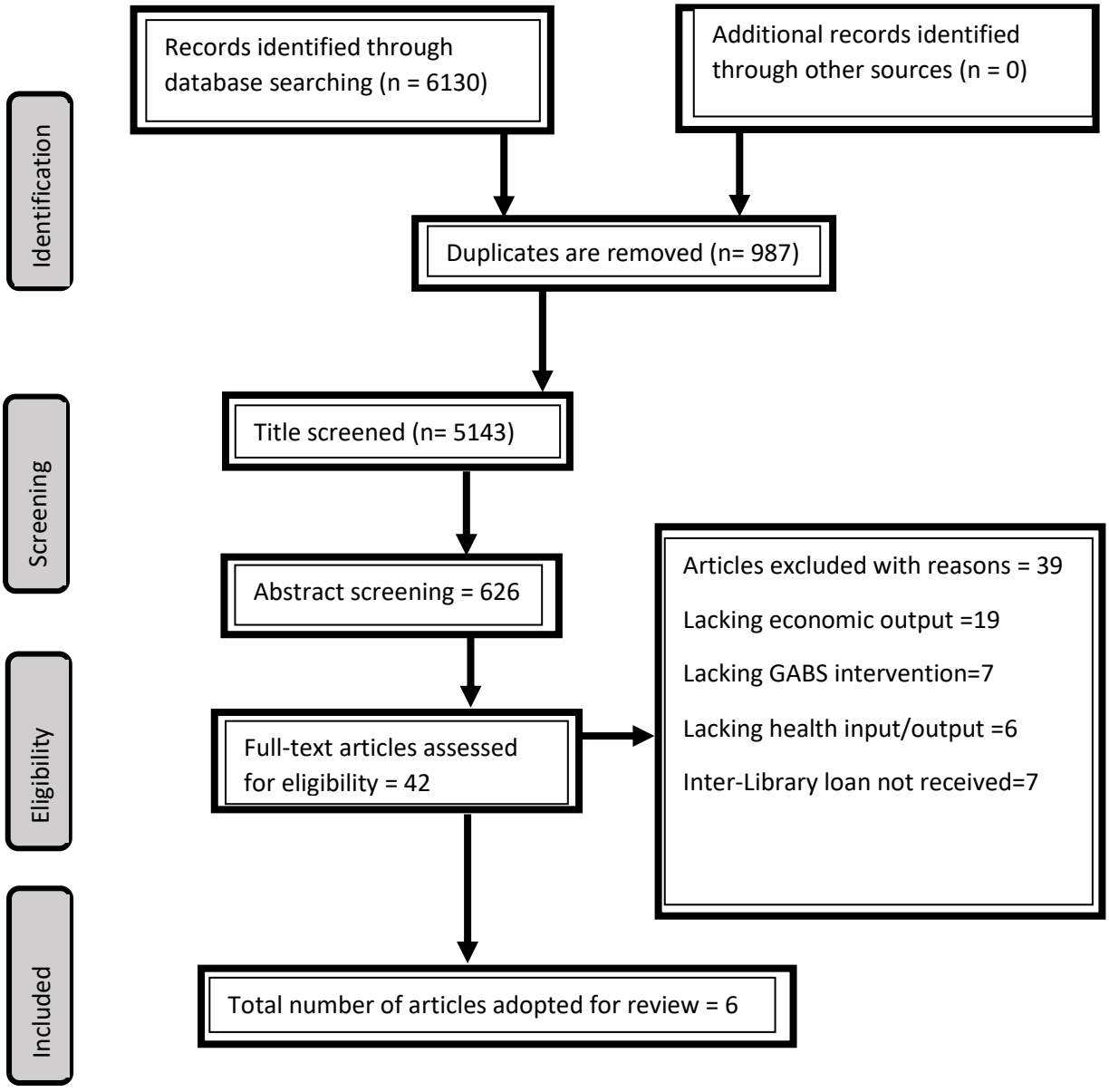

Diagram 1: Flowchart of literature search using the PRISMA strategy

Inclusion Criteria

To be included in this study all peer-reviewed literature must meet the following criteria; First, all literature must be relevant to natural/simulated natural environment which includes green, blue and natural outdoor spaces. The relevance of the first criteria should as a function of the impact of economics on green and blue spaces as it relates to public health. To analyse these three variables (GABS, economics and public health) we will select papers that model or apply economic techniques to synthesis its result.

Exclusion Criteria

In this study, the authors will exclude publication that is not English based. Likewise, publications that are systematic reviews will be excluded, as data should be pulled and analysed from the actual study itself. We can at the end of the study compare results with other systematic review and studies and this does not hinder us from citing such publications in the background or building a case for this study. Publications that do not focus on the three primary objectives of GABS, economics and Public Health will be excluded from the study. A publication focusing on just two primary objectives will be excluded from the study. Conference abstract without full publication article is excluded from this study.

Table 1: Keywords for mixed methods search strategy

Green or blue space (e.g. park or lake)	Activity	Health and wellbeing	Economic measurements or other wellbeing outcome
Biodiversity	Activ*	Aerobic capacity	Adjust*
Blue	Active	Behaviour change	Analys*
Blue area	citizen*	maintenance	Autoregress*
Blue space	Active	Behaviour change	Binomial
Canal*	commute	technique*	Bias*
Environment*	Active	Bio-diversity	Cohort
Forest*	transport	benefits	Conjoint analysis
Fountain	Allotment*	Care	Contingent behaviour
Fresh	Anxiety	Cardio respiratory	Contingent valuation
Game reserve*	Bike*	fitness	Correlat*
Garden*	Blading	Child	count data models
Green area	Cardio*	development	Cost analysis
Green	Canoeing	Effect	Cost benefit
Green space	Climbing	Exercis*	Cost effective*
Green*	Countryside	Fit	Cost effective analysis
Greenway	Cycl*	Fitness	Cost of illness
Harbor	Dance*	Green care	Cost outcome
Harbour	Dancing	Happiness	Cost utilit*
Hills	Depression	Health	Cost-effectiv*
infrastructure*	Diving	Health*	Cost-utilit*
Lake*	Driving	Health benefits	Cycle tree*
Marina*	Endur*	Health impact	Data
Mountain*	Exerc*	Life satisfaction	DALY
Natur*	Exercise	Lifestyle choice*	DCE
Natural	activit*	Lifestyle option*	Decision tree
Neighbourhood	Exercise	Mental	Decision analys*
Open air	choice*	Mental distress*	Deviat*
Open space*	Exercise	Mental health	Discrete choice*
Park	endur*	benefit*	Distribution
Parks	Exercise	Mental wellbeing	Experiment*
Place*	train*	Mental well-	Economic analys*
Pond*	Experience	being	Economic evaluation*
Port*	Fitness class	Morale	Economic review
Public open	Fitness prog*	Non-market	Econom*
River*	Fitness	benefit*	Economics
Reserve	regime*	Pain	Error*
Space*	Gardening	Personal	Estimat*
Sea	Guidance	development	Evaluat*
Space*	Health walk	Physical benefit*	Forecast*
Stream*	Horticultur*	Preventative	Health impact assessment
Surf*	Jog*	effect*	Health related quality of life
Tree*	Keep-fit	Psychological	Hypothesis
Therapeutic	Kyaking	Quality of life	HYE
Landscape	Led walk	Recovery	Impact analys*
Urban forest	Leisure	Restor*	Markov

Urban green	Moderate	Self rated health	Markov process*
Urban park	vigorous*	Self*	Markov state*
Urban water	Motor	Social	Measur*
View*	activit*	Social capital	Mental
Waterfront	Muscular	Social inclusion	Model*
	Outdoor*	Stress	Monte Carlo
Wilderness	Park run*	Wellbeing	multi-nomial logit
Wildlife	Physical	Well-being	Opportunity cost
Wood*	activit*		Probabilit*
	Physical		probit
	education		QALY
	Physical		OLS
	endurance		QoL
	Physical		Ordinary least square
	fitness*		Parameter*
	Physical		Quality adjusted life year
	training		Random*
	Play		Regress*
	Play things		regression
	population		Return on investment
	Public		Revealed preference
	Recreation		Sampl*
	Recreatio*		Sensitiv*
	Resilience		Simulation
	training		Social cost benefit
	Rollerblading		Social prescribing
	Rollerskating		Social return on investment
	Rowing		Square
	Run		SROI
	Running		Stated preference
	Skating		Statistic*
	Sport*		Statistical Analysis
	Strengt*		Test
	Strength		Tobit
	training		Trade-off*
	Swim		Transition
	Swimming		Travel cost model
	Therap*		Tree
	training		Variance
	Walk*		Variable
	Weight		zero inflated
	lifting		
	Yoga		