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# A SYSTEMATIC REVIEW OF ECONOMIC EVALUATION STUDIES OF GREEN AND BLUE SPACES IN IMPROVING POPULATION HEALTH

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# Physical activity and green and blue space



# Rationale

- Aging population and increase in chronic illness
- 60% of the Welsh population are either overweight (38%) or obese (22%)
- 34% of adults were inactive (active less than 30 minutes the previous week), inactivity is highest among older adults and adults in more deprived areas (National Survey for Wales 2017-18: Population Health)
- Creating an Active Wales (2009) aim is to support the development of and access to well designed and maintained built environments and natural environments across both urban and rural communities in Wales
- Priority: Increasing availability, access and use of high quality local green space, waterways and countryside
- Start Active Stay Active (2011) guidance focus on being active every day, and over a week adults should aim for 150 minutes of moderate intensity activity in bouts of 10 minutes or more
- Public Health (Wales) Act (2017) tasks Welsh Government with developing a national strategy on preventing obesity and reducing obesity levels in Wales

# Legislation and policy

- *Prudent healthcare (2014)*- Achieve health and wellbeing with the public, patients and professionals as equal partners through co-production
- *The Well-being of Future Generations (Wales) Act 2015*. Well-being duty is based on the principle of sustainable development and encompasses economic, social, environmental and cultural factors
- *The Well-being of Future Generations (Wales) Act 2015*: Duties or aspirations? (Davies, 2016)  
Sustainable development requires all public bodies to set out 'well being' objectives that are designed to maximise its contribution to achieving each of the well-being goals, and taking all reasonable steps to meet those objectives
- *Welsh Government. (2017). Prosperity for All: The national strategy*  
Aim is to improve health and well-being in Wales, for individuals, families and communities.  
Well-being objectives- Promote good health and well-being for everyone and build healthier communities and better environments

# Pembroke coastline



# Evidence of the intervention of: Green and Blue Spaces (GABS)

Systematic review was undertaken to answer the following questions:

- How do green and blue spaces improve the health and wellbeing of the population?
- How do we measure and quantify the impact of green and blue space to public health?
- Is there an appropriate model to pull all data to give a more informed decision on green and blue spaces?

# Aim and objectives

- The aim of this systematic review is to investigate the econometric techniques used to estimate the value of the health benefits of engagement in physical activity in GABS
- To date there is no standardised approaches applied of economically measuring the value of the health benefits of participating in physical activity in GABS

## Objectives

- To determine the body of evidence that is available on economic evaluations exploring natural environments
- To examine the health benefits of natural environments
- To explore the literature to estimate the value of access to natural environments (use and non use value) to understand the Total Economic Value (TEV) of GABS

# Methodology

- A systematic literature search in line with PRISMA guidelines was conducted
- Peer-reviewed articles are sought using electronic databases, scrutiny of reference lists and grey literature to answer the following research questions:
  - What modelling techniques and methods have been used to explore the value and benefits of green and GABS as a means of improving population health?
  - What are the available standard tools for evaluating nature based health and wellbeing interventions?
- Review follows the University of York Centre for Research and Dissemination (York CRD) principles for conducting searches and extracting data  
(Centre for Reviews and Dissemination, 2009)
- PICO framework

# Research design

- **Inclusion criteria**

- Green blue and natural outdoor spaces
- First criteria should in combination with economics: the role and impact of economics in GABS
- The effect of natural outdoor spaces in public health were economics is the dependent variable
- To analyse these three variables (GABS, economics and public health) papers were selected that model these conditions
- Time limit 1988-2018
- Literature written in English or Welsh language

- **Exclusion criteria**

- Publications which do not reference GABS or natural outdoor spaces no reference to economic evaluation or public health
- Systematic reviews
- Literature before 1988
- Literature not in the English or Welsh language
- Grey literature

# Snowdonia



# Data extraction

- **Keywords:** economic evaluation, green spaces, blue spaces, valuing nature, public health benefits
- **Conducted** 14<sup>th</sup> of February 2018
- **The electronic databases:** ASSIA, CINAHL, PsycInfo, PubMed, Web of Science, DARE, NHS EED, HTA and Cochrane Collaboration Register and Library
- Author(s), publication year and title
- Conducted by three researchers (ML,VE,LHS) two of which independently extracted the publications at each stage and agreed all papers selected, if there is any literature both disagreed on the third researcher vetoed that literature
- CASP tool

# Evidence synthesis tool

Populations	Intervention	Comparison	Outcomes
<b>Any outdoor space which may enhance wellbeing and health</b>	Any nature based intervention or initiative to improve health and wellbeing	Any nature based intervention or initiative	Any econometric techniques and modelling evaluating health and wellbeing outcomes in green and blue spaces

# Databases

DATABASE	Titles (n)	Agreed titles (n)	Abstracts agreed (n)	Papers reviewed (n)	Final papers included (n)
PubMed	134	20	2	2	1
Cochrane Library					
Science Direct					
CINAHL	498	104	3	2	
ASSIA	155	39	1	1	
PsycINFO	542	128	1	0	
Web of Science	4801	335	40	37	5
NHS EED					
DARE					
<b>TOTAL</b>	<b>6130</b>	<b>626</b>	<b>47</b>	<b>42</b>	<b>6</b>

# Results

- 6130 titles
- 987 duplicates
- 6 peer reviewed papers met the inclusion and exclusion criteria
- Themes-
  - Stated Preference (SP) techniques
  - Economic Output

Theme 1. Stated Preference literature	Method	Models
Campos, P., Caparros, A., & Oviedo, J. L. (2007). Comparing payment-vehicle effects in contingent valuation studies for recreational use in two protected Spanish forests. <i>Journal of Leisure Research</i> , 39(1), 60–85.	Contingent Valuation Method	Dichotomous models
Doctorman, L., Boman, M. (2016). Perceived health state and willingness to pay for outdoor recreation: an analysis of forest recreationists and hunters. <i>Scandinavian Journal of Forest Research</i> , 31(6), 611–617.	Contingent Valuation Method	Ordinary Least Square (OLS)
Hakansson, C., Ostberg, K., & Bostedt, G. (2016). Estimating distributional effects of environmental policy in Swedish coastal environments - a walk along different dimensions. <i>Journal of Environmental Economics and Policy</i> , 5(1), 49–78.	Choice Experiments	Latent Class Models (LCM) and Multinomial Logit Model (MNL)
<b>Theme 2. Economic outcome</b>		
Blair, D., Giesecke, C., & Sherman, S. (1991). A Dietary, Social and Economic-Evaluation of the Philadelphia Urban Gardening Project. <i>Journal of Nutrition Education</i> , 23(4), 161–167.	Economic value	Scheffe procedure
Cordell, H., Bergstrom, J., Ashley, G., & Karish, J. (1990). Economic-Effects of River Recreation on Local Economies. <i>Water Resources Bulletin</i> , 26(1), 53–60.	Total effects	IMPLAN model
Wade, T. J., Sams, E. A., Beach, M. J., Collier, S. A., & Dufour, A. P. (2013). The incidence and health burden of earaches attributable to recreational swimming in natural waters: a prospective cohort study. <i>Environmental Health: A Global Access Science Source</i> , 12, 67.	Economic and physical burdens	Multivariate Logistic Regression models

# Theme 1: Stated Preference key findings

- SP techniques and in particular CVM are effective and efficient econometric methods which capture the value and health benefits associated with leisure time activities in GABS
- In the Contingent Valuation method trip expenditures are an integral design feature to estimate the public's value and welfare benefits of accessing and using GABS
- The public perceive that there are health benefits associated with engagement in recreational activities outdoors and are WTP to gain the health benefits and not to have to forgo the experience
- Modelling techniques used in association with SP techniques take account of heterogeneity among the population and compare within groups and can identify the variances in WTP estimates as well as protest bids

(Campos et al.,2007; Doctorman and Boman,2016; Hakansson et al., 2016)

# Theme 1: Value estimates for total economic value of outdoor recreation

	Year 2007	Year 2018	GB£ 2018	Euro 2018	US \$ 2018
WTP to avoid postponement of recreational activities					
Hunters	8.87 SEK	9.76 SEK	£0.88p	€0.99	\$1.22
Forest recreationalists	7.57 SEK	8.33 SEK	£0.75p	€0.85	\$1.03
WTP for not losing the health benefits of outdoor experience					
Hunters	65 SEK	71.50 SEK	£6.45	€7.27	\$8.88
Forest recreationalists	17 SEK	18.70 SEK	£1.69	€1.90	\$2.32

## Theme 2: Economic outcomes Key findings

- Community gardening programmes have benefits for the public's mental and physical health, promoting the adoption of healthier behaviours as well as assisting in the development of social capital and social cohesion
- Valuation estimates indicate that the public can gain economically from interaction with green spaces by means of gardening plot yields and net value (Blair et al. (1991))

	Year 1987	Year 2018	GB£ 2018	Euro 2018
<b>Gardening plot value</b>	\$160 ± \$ 178	\$354 ± \$394	£266 ± £296	€137 ± €152
<b>Value of gardening plot yield</b>	\$101 to \$500	\$223 to \$1,107	£167 to £833	€191 ± €949
<b>Net value of gardening plot</b>	\$113	\$250	£188	€214

# IMPLAN input output model

- River recreational activities can have a positive economic impact on local communities and economies
- Creation of employment from 60 to 292 jobs (Cordell et al.,1990)

	Year 1986	Year 2018	GB£ 2018	Euro 2018
<b>Mean value per trip</b>	\$19.42 to \$40.89	\$44.58 to \$93.86	£33.67 to £70.91	€38.26 to €80.59
<b>Value of economic growth</b>	\$2.57M to \$13.35M	\$5,899,463 to \$30,645,071	£4,457,314 to £23,152,228	€5,064,839 to €26,299,587
<b>Total gross output</b>	\$1.22M to \$5.58M	\$2,800,523 to \$12,808,951	£2,115,734 to £9,676,886	€2,403,351 to €10,992,958
<b>Total income</b>	\$6.22M	\$14,278,078	£10,785,896	€12,254,413

## Valuation estimates for the physical and economic burdens of the public recreational use of natural fresh and marine waters

- The health burden for ear aches was calculated for 829 participants
- 24% of participants missed regular activities
- 31% required prescription medication
- 41% used over the counter medication
- 4% requiring a visit to the emergency room

	Year 2011	Year 2018	GB£ 2018	Euro 2018
Projected economic burden of ear aches associated with swimming in natural waters	\$59,980,000	\$67,085,957	£50,510,569	€57,410,064

# Summary

- SP techniques are proficient econometric methods to capture the use, welfare effects and benefits transfer value associated with recreational activities in GABS
- WTP estimates reflect the public perceived health benefits associated with participation in leisure time activities in GABS
- The public are WTP to gain the health benefits associated with recreation pursuits in GABS and 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, facilitate greater social cohesion as well as monetary benefits for individuals
- The economic impact of recreational activities in blues spaces have substantial economic benefits both for individuals and society as a whole
- Extrapolated estimates suggest there could be potential health burdens and associated costs with swimming in natural waters

# Conclusion

- SP techniques are the most applied approach to evaluate outcomes
- SP techniques used various modelling techniques and no standardised modelling techniques were applied

## Next

- A meta-analysis is currently being carried out
- Raw data has been accessed
- A model will be developed to compare with the published models to provide a standard for comparing GABS as an intervention method

## Costal walkway Conwy



Diolch am wrando  
Thank you for listening



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