

# Valuing green infrastructure (GI) improvements at Musgrave Park Hospital in Belfast, Northern Ireland.

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**Aim:** To use environmental valuation methods to estimate the economic benefits from a potential green infrastructure development at Musgrave Park Hospital's outdoor grounds in Belfast. Following, to conduct a cost-and-benefit analysis to assess the financial justifiability of the intervention.

## Problems – Site's current situation:

- 1) Scattered land plots covered by uninspiring, low diversity-valued grass with little functionality.
- 2) Poor connectivity between the land plots and the indoor facilities.
- 3) Poor access to the adjacent municipal park.



**Result:** Negligible use of the outdoor grounds and the nearby park from the hospitals' stakeholders (staff, patients, visitors etc.) with multiple foregone potential benefits (cognitive, psychological, physical and mental health benefits of interaction with nature are well-documented in the literature).



## Proposed Solution → Green Infrastructure development

**Green Infrastructure development:** Any improvement in land use that can enhance the natural environment and at the same time bring health and social benefits to its users.

### Study's Objectives :

- 1) To estimate welfare benefits from spending additional time outdoors with improved GI.
- 2) To estimate the Willingness-to-Pay for improved GI.
- 3) To estimate the effect of exposure to nature on the projected time spent outdoors under improved GI, and the Willingness-to-Pay.
- 4) To determine the financial justifiability of the intervention.

In essence, the **aim** is to determine by using survey-based instruments whether the following is true:

$$\text{Costs} = [\text{Construction}] < \text{Benefits} = \left[ \begin{array}{l} \text{Health} \\ \text{Environmental} \\ \text{Social} \end{array} \right] = \text{Total Willingness-to-Pay}$$

### Limitations in data collection:

- Relatively small sample size of hospital staff.
- Proxy methods to measure opportunity cost.
- Potential selection bias in recruiting visitors.

**Utility model:**  $U = U(\text{TimeSpentOut}, Q, Z)$

where,  $Q$ =Site's Quality attributes,  $Z$ =other goods,  $\text{TimeSpentOut}$ = time spent outdoors

### Methods:

**1) Contingent Behaviour:** To estimate welfare benefits from spending additional time outdoors with improved GI.

$$\text{TimeSpentOut}_{ij} = X_i\beta + p_i\gamma + Q_j\delta + \varepsilon$$

where  $X$ =sociodemographic information,  $p$ =travel cost,  $Q$ =Site's quality attributes.

**2) Contingent Valuation:** To estimate Willingness-To-Pay for improved GI.

$$\text{Pr}\{U_1(Y - \text{bid}, Q + q) > U_2(Y, Q)\}$$

Where  $Y$ =income,  $Q$ =Site's quality attributes,  $q$ =quality improvements,  $\text{bid}$ =price to pay for site's quality improvements,  $U_1$ =Utility in scenario with improvements,  $U_2$ =Utility in status quo scenario.

### Work ahead:

- Completion of data collection.
- Data analysis.