

**Impact case study (REF3)**

<b>Institution:</b> Royal Holloway, University of London		
<b>Unit of Assessment:</b> 4 Psychology, Psychiatry and Neuroscience		
<b>Title of case study:</b> Patient-Reported Outcome Measures (PROMs) benefit patient quality of life and the economy		
<b>Period when the underpinning research was undertaken:</b> 2002-2018		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b> Clare Bradley	<b>Role(s) (e.g. job title):</b> Professor of Health Psychology	<b>Period(s) employed by submitting HEI:</b> 1989-2020
<b>Period when the claimed impact occurred:</b> 1 <sup>st</sup> August 2013 to 31 <sup>st</sup> July 2020		
<b>Is this case study continued from a case study submitted in 2014?</b> Y		
<p><b>1. Summary of the impact</b></p> <p>Bradley has pioneered the development of Patient-Reported Outcome Measures (PROMs) for 15 chronic health conditions. These measures have underpinned new treatment pathways and changed how treatments are evaluated. Bradley's research formed the basis of a REF2014 impact case study. In the REF2021 period, her PROMs have <b>improved patient quality of life and treatment satisfaction</b> through extension to additional conditions, languages and countries; through impacts on the NICE guidelines for diabetes; and through contributions to the development and marketing of the diabetes drug Trulicity. Bradley's research has also <b>benefitted the economy</b>: her measures have generated approximately GBP5,500,000 in license fee income, reduced NHS treatment costs, and contributed to multibillion sales for Trulicity.</p>		
<p><b>2. Underpinning research</b></p> <p>The treatment of chronic health conditions is only successful long-term if it protects or improves <i>both</i> quality of life <i>and</i> quality of health. Professor Bradley has developed Patient-Reported Outcome Measures (PROMs) that identify threats to quality of life and treatment satisfaction for specific health conditions (e.g. dietary restriction in diabetes). The design of Bradley's PROMs is underpinned by rigorous qualitative and quantitative research using converging evidence from focus groups, in-depth interviews, and questionnaire studies (<b>R1</b>).</p> <p>Bradley's quality of life and treatment satisfaction PROMs are tailored to particular conditions, focusing on condition-specific treatment approaches and commonly experienced threats to quality of life. For people with diabetes, dietary restrictions such as meal timing may damage quality of life, whereas the experience of stigma is an important concern for people with HIV. Since 2000, Bradley has developed PROMs for 15 different chronic health conditions, including diabetes, cancer, eye diseases, HIV, dementia and kidney disease. The PROMs have been linguistically validated in over 120 languages and reach 70 countries. In the REF2021 period, 197 new language versions of the PROMs have been validated, including extension to nine new languages.</p> <p>Quality of life PROMs have been developed for use in 12 of the 15 conditions covered by Bradley's PROMs. Five of these 12 conditions are new for the REF2021 period (aneurysm, cancer, dementia, HIV and Parkinson's e.g. <b>R2</b>). Treatment satisfaction PROMs are available for 13 conditions, adding five conditions during the REF2021 period (aneurysm, COVID-19, dementia, Parkinson's and varicose veins). Bradley's research has demonstrated that the use of a common template and scoring algorithm allows for comparison of the impact of different conditions on quality of life.</p>		

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Bradley's most well-established PROMs focus on diabetes (**R3**). Effective diabetes treatment involves a careful balance of diet and insulin injections in order to manage blood glucose levels. Diabetes has wide-ranging implications for health. What Bradley's research (**R4**) highlighted for the first time was that dietary restriction was the greatest threat to quality of life, rather than insulin injections, as had been previously assumed. This has clear clinical implications: patients prefer treatments that prioritise dietary freedom, compared to treatments that minimise the number of injections.

Since the 1990s, Bradley had been aware of approaches from Dusseldorf and Vienna to improve treatment adherence. These approaches involved training patients to balance diet and insulin injections for themselves with as many as six or seven injections a day. As a consequence, patients had more freedom about what could be eaten and when. Bradley encouraged clinical colleagues in the UK to consider this approach for improving quality of life, culminating in the development and trial of the DAFNE (Dose Adjustment For Normal Eating) programme for type 1 diabetes (**R5**).

Bradley's research has shown that DAFNE improves not only blood glucose control, but also quality of life and treatment satisfaction, without leading to any significant weight gain or increase in hypoglycaemia (**R5**). Benefits were shown to be maintained over four years, without further intervention (**R6**).

### 3. References to the research

The following are all published in peer-reviewed journals with high standing in the field, a clear indicator that the research is significant, and conducted with high levels of rigour and originality. We report citations from Google Scholar from the date of publication to 31.12.2020, along with other indicators of quality where relevant.

- R1.** Mitchell, J., & **Bradley, C.** (2018). Design and development of the MacTSQ measure of satisfaction with treatment for macular conditions used within the IVAN trial. *Journal of Patient Reported Outcomes*, 2(1), 1-9. <https://doi.org/10.1186/s41687-018-0031-z>. 7 citations.
- R2.** Peach, G., Romaine, J., Wilson, A., Holt, P. J. E., Thompson, M. M., Hinchliffe, R. J., & **Bradley, C.** (2016). Design of new patient-reported outcome measures to assess quality of life, symptoms and treatment satisfaction in patients with abdominal aortic aneurysm. *British Journal of Surgery*, 103(8), 1003-1011. <https://doi.org/10.1002/bjs.10181>. 12 citations.
- R3.** **Bradley, C.**, Plowright, R., Stewart, J., Valentine, J., & Witthaus, E. (2007). The Diabetes Treatment Satisfaction Questionnaire change version (DTSQc) evaluated in insulin glargine trials shows greater responsiveness to improvements than the original DTSQ. *Health and quality of life outcomes*, 5(1), 1-12. <https://doi.org/10.1186/1477-7525-5-57>. 109 citations.
- R4.** **Bradley, C.**, & Speight, J. (2002). Patient perceptions of diabetes and diabetes therapy: assessing quality of life. *Diabetes/Metabolism Research and Reviews*, 18(S3), S64-S69. <https://doi.org/10.1002/dmrr.279>. 369 citations
- R5.** DAFNE Study Group. (2002). Training in flexible, intensive insulin management to enable dietary freedom in people with type 1 diabetes: dose adjustment for normal eating (DAFNE) randomised controlled trial. *BMJ*, 325(7367), 746. <https://doi.org/10.1136/bmj.325.7367.746>. 924 citations, included in RAE 2008.  
Note. Bradley and her then PhD student, J Speight, were members of the DAFNE Study Group i.e. authors.
- R6.** Speight, J., Amiel, S. A., **Bradley, C.**, Heller, S., Oliver, L., Roberts, S., ... & Thompson, G. (2010). Long-term biomedical and psychosocial outcomes following DAFNE (Dose Adjustment For Normal Eating) structured education to promote intensive insulin therapy in adults with sub-optimally controlled Type 1 diabetes. *Diabetes Research and Clinical Practice*, 89(1), 22-29. <https://doi.org/10.1016/j.diabres.2010.03.017>. 148 citations.

#### 4. Details of the impact

Professor Bradley's PROMs have enabled a patient-centred approach to chronic health conditions and their treatment. Impacts on patients, the NHS and the economy were articulated in a REF2014 case study. In the REF2021 period, Bradley's research has generated substantial new impacts by **improving patient quality of life and treatment satisfaction** through: (a) global reach of her PROMs; (b) changes to diabetes health guidelines; (c) diabetes patient training and community support; and (d) diabetes drug development. Bradley's research has also **benefitted the economy** through: (a) license fee income for Health Psychology Research Ltd (Bradley's spin-off company); (b) savings for the NHS; and (c) drug sales.

##### **Improving patient quality of life and treatment satisfaction**

###### *(a) Global reach of PROMs*

Bradley's PROMs are licensed by every major pharmaceutical company in the world, and are used widely by clinicians, academics and students. In the REF2021 period (**E1**), Health Psychology Research (HPR) Ltd has issued 2,156 commercial licences for the PROMs. HPR Ltd has also issued 453 non-commercial licences for use across 37 countries. HPR Ltd has provided 260 free licences to students and their supervisors in 52 countries.

The quality of life and treatment satisfaction PROMs have been validated and licensed for use with six new chronic health conditions (cancer, Parkinson's disease, HIV, dementia, aortic aneurysm, and varicose veins). Thus, the PROMs apply to many high prevalence conditions and are used widely across the globe. The substantial reach of the PROMs impacts directly on patients because it encourages the development of new treatments that improve patients' quality of life, as well as their health.

###### *(b) Changes to diabetes health guidelines*

Bradley's research applies to 15 chronic health conditions, and the significance of its impact on health guidelines is particularly clear for diabetes, through her work on DAFNE (Dose Adjustment For Normal Eating; **R5**). When Bradley's work was summarised for a REF2014 impact case study, the impacts of DAFNE for the NHS were just emerging. DAFNE is now recommended in the NICE guidelines (2015) as one of eight key treatment priorities for type 1 diabetes (**E2**): '*Offer all adults with type 1 diabetes a structured education programme of proven benefit, for example the DAFNE [programme].*' The NICE guidelines cite research conducted by Bradley and others (**including R5 and 6**). Bradley's cited research shows the cost effectiveness of DAFNE, and its benefits for quality of life and treatment satisfaction compared to other programmes.

###### *(c) Diabetes patient training and community support*

The DAFNE training programme for type 1 diabetes is now available in the UK, the Republic of Ireland, Australia, New Zealand, Singapore and Kuwait. In the UK, approximately 3,000 type 1 diabetes patients now graduate from the DAFNE programme each year, corresponding to 19,000 in the REF2021 period (**E3**). The benefits of DAFNE are articulated on DAFNE.NHS.UK (**E3**): "*DAFNE... reduce[s] the negative impact of diabetes on a person's quality of life in terms of anxiety, stress and time spent at the doctor's [sic] or hospital appointments...improve[s] treatment satisfaction by enabling individuals to understand how to get the best results from their insulin therapy*" and "*DAFNE allows you to fit diabetes into your lifestyle, rather than changing your lifestyle to fit in with your diabetes.*"

The benefits of DAFNE for quality of life are further evidenced by DAFNE Online. This is an online community of patients and health professionals, created by two people who had completed the DAFNE programme in the UK. Since 2020, the DAFNE Online website and forum has been accompanied by the DAFNE Online app. DAFNE Online now has members from all over the world. It brings diabetes patients together to share experiences and provide support. Testimonials from the forum (**E4**) show that within the REF2021 period "*DAFNE counts for me as a life-changing experience*", it engenders "*a whole new outlook on my diabetes*", "*Happiest*

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*and the most confident [I] have felt with my diabetes in a long time”, and “For the first time I see myself as being the one to make Diabetes fit into my life and not the other way round.”*

**(d) Diabetes drug development**

In the REF2021 period, PROMs have been used, for the first time, to market a diabetes drug. Research using Bradley's Diabetes Treatment Satisfaction Questionnaire (DTSQ) showed that treatment satisfaction for type 2 diabetes patients is improved with new drug dulaglutide (marketed as Trulicity), compared to another drug called exenatide (**E5**). This finding underpinned a labelling claim for dulaglutide (**E5, E6**), allowed by the European Medicines Agency in 2015 (**E7**). The labelling claim means that the information sheet in the drug pack can state that patients' treatment satisfaction is improved with dulaglutide, compared to exenatide. This is the first time that a labelling claim based on a PROM has been successful for a diabetes drug. Research (**E5**) and testimony from Matthew Reaney (**E6**), former head of the Diabetes Health Economics and Outcome Research (HEOR) group for Eli Lilly, evidences the link between Bradley's research and the labelling claim. Matthew Reaney's testimony also underlines the importance of Bradley's work for promoting patient perspectives in treatment evaluation (**E6**): *“The inclusion of PRO data in the product label demonstrates a regulatory acknowledgement of the relevance of the patient perspective”*.

**Benefits to the economy via licences, savings for the NHS and sales of drugs**

During the REF2021 period, Bradley's research has been used to increase the sales of licences, boost savings in the NHS, and increase drugs sales, thereby benefitting the economy.

**(a) License fee income for Health Psychology Research (HPR) Ltd**

Bradley's PROMs have generated approximately GBP750,000 per annum for Bradley's spin-off company, HPR Ltd, corresponding to a pre-tax income of GBP5,454,487 during the REF2021 period (**E1**). Approximately 80% of these sales represent international investment to the UK.

**(b) Savings for the NHS**

It is estimated that the education of 19,000 DAFNE graduates via NHS DAFNE centres has saved the NHS approximately GBP30,000,000 in the REF2021 period. This figure is based on savings of GBP1,540 per graduate per 7 years (**E8**).

**(c) Drug sales**

Bradley's PROMs have been used in the development of drugs across the chronic health conditions that they cover. Notably, Bradley's Diabetes Treatment Satisfaction Questionnaire (DTSQ) was used to demonstrate benefits for the type 2 diabetes drug dulaglutide (trade name Trulicity), noted in the drug label since 2015. Since its launch in 2015, dulaglutide has generated more than USD10,000,000,000 in worldwide sales for US pharmaceutical company Eli Lilly (**E9**).

**5. Sources to corroborate the impact****E1. Health Psychology Research Ltd report**

Includes details of license sales, user countries, conditions, languages and finances

**E2. 2015 NICE guidelines for Type 1 Diabetes**

Full guidelines, detailing the recommended use of DAFNE for Type 1 Diabetes

**E3. DAFNE website**

Website detailing the user numbers of DAFNE per year and the benefits of DAFNE:

<https://dafne.nhs.uk/>

**E4. DAFNE online testimonials**

Collection of testimonials written by users on the DAFNE community website

**E5. Labelling claim article**

Article by Reaney et al. reporting use of Bradley's PROM (DTSQ) in research underpinning labelling claim: Reaney, M. , Yu, M. , Lakshmanan, M. , Pechtner, V. and van Brunt, K. (2015), *Treatment satisfaction in people with type 2 diabetes mellitus treated with once-weekly dulaglutide: data from the AWARD-1 and AWARD-3 clinical trials*. *Diabetes Obes Metab*, 17:896-903. doi.org/10.1111/dom.12527

**E6. Testimonial from Matthew Reaney, ex-head of Diabetes HEOR group at Lilly**

Testimonial stating that Bradley's PROM (DTSQ) was used in the research underpinning the labelling claim and article written by Reaney

**E7. Dulaglutide labelling claim**

Labelling claim from Eli Lilly stating Trulicity has significantly increased treatment satisfaction.

**E8. NICE 2015 costing statement**

DAFNE NHS savings per patient based on the NICE costings statement. Page 2.

Notes. Savings are an estimated GBP2,200 per patient over a ten-year period. We have calculated the saving over a seven-year period:  $2200 \times .7 = £1540$

**E9. Dulaglutide/Trulicity sales document**

Document containing links to Eli Lilly sales figures from 2015-2019