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Validating Health Impact Assessment: prediction is difficult (especially about the future)

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Abstract

Health Impact Assessment (HIA) has been recommended as a means of estimating how policies, programmes and projects may impact on public health, and on health inequalities. This paper considers the difference between predicting health impacts, and measuring those impacts. It draws upon a case study of the building of a new hypermarket in a deprived area of Glasgow, which offered an opportunity to reflect on the issue of the predictive validity of HIA, and to consider the difference between potential and actual impacts. We found that the actual impacts of the new hypermarket on diet differed from that which would have been predicted based on previous studies. Furthermore they challenge current received wisdom about the impact of food retail outlets in poorer areas. These results are relevant to the validity of HIA as a process and emphasise the importance of further research on the predictive validity of HIA, which should help improve its value to decision-makers.

Keywords: Health assessment; public health; policy appraisal

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1. **Introduction**

Health Impact Assessment (HIA) has emerged in recent years as an important means of promoting healthy public policy. It developed from a concern that major social interventions – such as public policies – could have negative health effects, and that the consideration of human health effects played a too-limited role in EIA.[1] The importance of HIA has been emphasised in successive EU and WHO policy documents, statements and recommendations, and in the UK it has been advocated as a key means of addressing health inequalities.[1,2] Although the range of activities described as HIA is broad, it now describes "the prospective estimation of potential impacts of a proposed policy or programme on a population's health, or any combination of procedures or methods by which a proposed policy or programme may be judged as to the effects it may have on the health of a population".[2] In a similar vein, in the UK the Independent Inquiry into Inequalities in Health recommended that, "…as part of Health Impact Assessment, all government policies likely to have a direct or an indirect impact on health inequalities should be evaluated in terms of their impact on health inequalities".[22] It has been suggested that by this statement the UK Independent Inquiry intended HIA to encompass not just prospective estimation of *potential* impacts but also the *actual* evaluation of the impacts of new policies, programmes or policies.[5] This paper discusses the difference between "actual" and "potential" health impacts, and gives some reasons why this issue is important to the validity and utility of HIA.

2. The need to consider accuracy of HIA predictions

The predictive aspect of HIA is one of its defining characteristics.[4] However the validity of those predictions remains something of an open question. It has been suggested that

the criterion of predictive validity has limited applicability, as it is not possible to follow up very long-term consequences, and it is not possible to verify the counterfactual – that is, it is not possible to check the accuracy of predictions for options that were not chosen.[3] However the necessity of empirically testing the predictive validity of HIA process has also been underlined, and Parry and Stevens for example, have contrasted the marked difference in attention given to the prediction of health impacts ("considerable") and that given to the appraisal of whether those predictions that resulted in modification of policy were actually accurate ("fleeting").[18] They also advocate the use of methods to measure change in communities by the intervention (such as a policy) as well as in control populations, and a greater use of robust qualitative and quantitative approaches in HIA - including existing epidemiological techniques, and in particular the use of before and after designs with control populations.[18]

The assessment of the predictive validity of HIA (how accurate do the predictions of HIAs prove to be)? is crucial. As noted above, prediction is one of HIA's defining characteristics, the other being that it should inform decision-making. It is obviously essential that information is accurate, but we know from other sources that expert predictions about health are subject to bias, and the accuracy of judgments of health professionals, and the evidence on which those judgements are based, have come under particularly close scrutiny over the past decade with the rise of evidence-based medicine, and, latterly, evidence-based public health.[10 13] While public health practice is often based on the plausibility of effects, political considerations, and timeliness, as much as on scientific evidence, there are ample examples of cases where plausible effects did not

materialise or did not turn out as expected, or where interventions which were expected to be beneficial turned out to be harmful, such as cycling promotion campaigns in children.[20] [14] In short, the scientific evidence and the accuracy of expert predictions in questions of health have often been found wanting. Why should HIA be any different?

We had the opportunity to reflect further on some these issues as a result of having recently completed an evaluation of the impacts of a new hypermarket in a deprived area of Glasgow. This study was funded by the UK Department of Health under Phase 1 of its Inequalities in Health Initiative within the sub-theme of "Health Impact Assessment". Rather than carry out a formal HIA, we elected to assess the *actual* impacts of the hypermarket using a prospective (before and after) design, with a control group. While this is an evaluation, and not an HIA (which would have involved an emphasis on screening, scoping, assessment, and decision-making) it is of interest because the design meets some of the criteria outlined as necessary for informing HIA decision making,[18] It thus offers an opportunity to reflect further on the issue of predictive validity, and on the gulf between potential and actual impacts, which is germane to the validity of HIA as a process and as an aid to better decision-making. We begin with a description of the study design and an outline of the findings.

2. The study: an evaluation of the health impacts of a new hypermarket in a deprived community

The 'intervention' being assessed in this case was the development of a new Tesco hypermarket which opened in November 2001 in one of the most deprived locations in the United Kingdom (Springburn, Glasgow). We compared change in diet and self-reported health in the area where a new hypermarket was built (the intervention area), with a similarly-deprived comparison area in Glasgow (Shettleston), using a quasi-experimental study design. Data were collected by means of a postal survey both before and one year after the hypermarket was built, in order to assess changes in diet, self-reported health, and perceptions of the neighbourhood. Changes in the retail structure in both areas were assessed through a before and (repeated) after intervention shop count survey. Qualitative data on diet, the neighbourhood and the impact of the store were collected by means of focus groups. Initial results from the various strands of this study are in press.[8 7]

Intervention and comparison areas were well-matched by level of deprivation (Carstairs-Morris DEPCAT), with each area having a DEPCAT of 7 (where a score of 1 represents the most affluent and 7 represents the most deprived). They had high levels of smoking (about 50% in both areas), a mean income of around one-third below the Scottish average, low levels of fruit and vegetable consumption (about a third eat fruit daily), and high levels of ill-health (about 30% with limiting long-standing illness). Male life expectancy in both areas declined during the 10 years from 1991 to 2001, and is 9.2%

(66.6 years) (intervention area) and 12.9% (63.9 years) (control area) below the Scottish average of 73.3 years.

The hypermarket itself was built on the site of an old British Rail engineering works.[9] As well as being the largest Tesco store in the Glasgow area, this development was widely seen as having the potential to make a significant contribution to urban area regeneration by providing long-term training and job security for local people. It was anticipated that about 450 jobs would be provided. Tesco promised to train local unemployed people in basic and retail skills with the promise of a job at the end of their training. This reflected Tesco's wider objective of forming regeneration partnerships with the public sector. In the case of Springburn this involved links with Glasgow Chamber of Commerce, a local training college, and regeneration companies (among others).[21]

In terms of public health, the hypermarket was a legitimate subject for assessment, as here has been much written in recent years about environmental influences on diet, and in particular the concept of food deserts.[6] One previous study had examined the effects of major new food retail provision on diet in a 'food desert'; an uncontrolled before-and-after 'intervention' study of changes in food consumption patterns in a deprived area of Leeds following the building of a new Tesco superstore. This found a statistically significant increase in fruit and vegetable consumption amongst those switching to the new store and a non-significant increase among those respondents who had switched from limited range discount stores, with the increase amounting to approximately three portions per week (REF – Wrigley).[24,25] One other study funded by the UK's Food

Standards Agency[23] had examined retail access to a 'healthy' and affordable diet in Newcastle (UK), and concluded that retail provision was not independently associated with diet. The general literature and the policy rhetoric was in accord that inequalities in retail access may contribute to diet-related health inequalities.[6]

It was in this context that we carried out our study. Briefly, we found little evidence that the opening of the hypermarket had any major effect on fruit and vegetable consumption. Crucially, while there was an increase in the intervention area of about a third of a portion per day, a similar increase in consumption was observed in the control area. Moreover the new store appeared to have little effect on the retail structure in Springburn (the intervention area). Contrary, perhaps, to expectations, this major development did not significantly impact on the most plausible health-related outcome – diet.

These findings led us to reflect further on three of the methodological issues raised in previous criticisms of HIA, as described at the outset of this paper; (i) the need for control groups; (ii) the need for robust quantitative assessment of actual impacts; and (iii) the need for predictive validation. These are considered in turn below.

3. Methodological reflections

3.1 The need for control groups in monitoring impacts

In any assessment of the impact of an intervention one needs to consider the counterfactual; what would have happened in the absence of that intervention. In our example, without a control area we would have attributed the small change in diet in the

intervention area to the new hypermarket; yet similar change was observed in the control area. This corroborates the view that it is not enough to predict impacts, or even to monitor them before and after the project or policy in question is implemented; monitoring in the affected area alone may introduce bias. Robust monitoring of impacts requires assessment of the change in both the affected area and in the control area. Calls for existing robust epidemiological techniques to be more widely used – including the use of better scientific methods, robust quantitative approaches to measuring impacts, and controlled studies [15 18] – have echoes in similar debates in EIA, and also in recommendations for greater use of BACI (Before-After/Control Impact) methods to monitor impacts.[17, 19] The data from the hypermarket study provides empirical support for these recommendations.

3.2 The need for robust quantitative and qualitative assessments of impacts

Mindell et al. (2001) make the case for considering qualitative data in their paper describing the requirements for robust HIA ("not everything that is important can be quantified").[15] It has also been suggested that more extensive use of quantitative epidemiological techniques could be considered in HIA, including time series analysis and decision analytic modeling. The hypermarket study used both a conventional epidemiological technique (a quasi-experimental design) and qualitative data collection. This was carried out after the building of the hypermarket. A repeated retail survey was also carried out to collect information of the impact of the store in the local retail sector. This involved baseline survey work to 'map' the retail structure and then repeat surveys on 6-monthly intervals to assess change. Existing sources (e.g. data from local authority

surveys and trade bodies) were used, but 'street-walking' in both areas identified errors, omissions and changes from these sources.

The resources available to us for new data collection would be unlikely to be routinely available to HIA practitioners. However, qualitative and quantitative data is often collected in HIA which could in some cases be treated as baseline data,[11] with a view to returning after the project has been constructed, or the programme implemented.[11] In the case of the hypermarket study, qualitative data suggested a lack of impact of the new store which was corroborated by similar findings from the quantitative arm of the study. It also allowed us to investigate the impact of the store on locals people's perceptions of the quality and range of food available to them, and to explore attitudinal and other barriers to use of the hypermarket. Qualitative data is rarely used longitudinally to monitor the impacts of interventions, but greater use of this approach may make an important methodological and empirical contribution to the field of HIA. We do however acknowledge that there can be considerable barriers to recruitment to qualitative research, and consideration needs to be given to issues of recruiting and retaining respondents in such studies.[12]

3.4 The need for predictive validation

On the basis of existing theory about diet and health, and past research, we would perhaps have expected some change in diet in the community where the store was built, yet the reality proved somewhat different, underlining the importance of testing the validity of predictions with actual data. This concern with the quality of prediction is not

unique to HIA of course. Morrison–Saunders and Bailey (2003), in their analysis of practitioners' views of the role of science in EIA (Environmental Impact Assessment), drew attention to the lack of scientifically rigorous impact predictions, and pointed out that decision-makers are more likely to pay attention to and use impact predictions when they are derived in a scientifically rigorous manner.[17] In terms of assessing predictive validity it would be particularly useful to revisit some of the completed HIAs as described by Mindell et al. in their report of the HIA of the mayor of London's draft transport strategy.[16] Determining whether impacts - and the distribution of impacts - materialised as expected would be enormously helpful to those conducting future HIAs. It may also make a valuable contribution to the public health evidence base.

4. Retrospective validation of HIA: a suggestion

Prospective validation is not the only means of validating the accuracy of HIA predictions. Retrospective desk-based tests of the predictive abilities of HIA practitioners, in which predictions about the effects of selected completed developments are compared with the actual results derived from monitoring or evaluation, may shed some light on how evidence is used and weighted in HIA, and provide an indirect estimate of the validity of HIA predictions. As far as we are aware however such retrospective examinations of HIA predictions are not routinely conducted. We used the hypermarket study findings to test this retrospective approach, in which three classes of postgraduate Masters of Public Health students (about 45 in total) were given details of the development of the Tesco hypermarket, but not the study findings, and details of the local

population and area in which it was built. There were also given the relevant sections of the Merseyside HIA Guidelines (http://www.ihia.org.uk/document/merseyguide3.pdf) which describe the key influences on health, and the matrix onto which the impacts can be entered, along with an indication of whether those impacts are "positive" or "negative". They were then asked – based on their own knowledge of the social determinants of health, and using the guidelines – what the impacts of the supermarket were likely to be on a range of outcomes, including diet, social participation, employment opportunities, social networks, traffic, and local environmental problems (including noise and fumes). In general students proved able to accurately predict the range and nature of impacts, though the lack of effect of the hypermarket on diet was rarely identified. This simple "thought experiment" was conducted as a learning exercise, rather than as a formal test of the predictive validity of HIA, but gives an idea of how this may be assessed formally.

However while such retrospective exercises, carried out with actual HIA practitioners, may provide pointers to how HIA may be improved, real-life prospective research into the matter is what is now required.

5. Conclusion

Physicist Neils Bohr once joked, "Prediction is difficult - especially about the future". This is precisely why we need to know how HIA performs as a predictive tool. We need to know not just whether policies are changed as a result of HIA, or whether participants are satisfied with the process, but whether the predictions that are made about health are accurate. It is surprising that there have been so few attempts to find out, yet the validity

and credibility of HIA depends on evaluating its performance. Research to answer this question is overdue.

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