How do individuals' health behaviours respond to an increase in the supply of health care? Evidence from a natural experiment

Eleonora Fichera[*], Ewan Gray, Matt Sutton

Manchester Centre for Health Economics, University of Manchester, United Kingdom

ABSTRACT

The efficacy of the management of long-term conditions depends in part on whether healthcare and health behaviours are complements or substitutes in the health production function. On the one hand, individuals might believe that improved health care can raise the marginal productivity of their own health behaviour and decide to complement health care with additional effort in healthier behaviours. On the other hand, health care can lower the cost of unhealthy behaviours by compensating for their negative effects. Individuals may therefore reduce their effort in healthier lifestyles. Identifying which of these effects prevails is complicated by the endogenous nature of treatment decisions and individuals' behavioural responses. We explore whether the introduction in 2004 of the Quality and Outcomes Framework (QOF), a financial incentive for family doctors to improve the quality of healthcare, affected the population's weight, smoking and drinking behaviours by applying a sharp regression discontinuity design to a sample of 32,102 individuals in the Health Survey for England (1997—2009). We find that individuals with the targeted health conditions improved their lifestyle behaviours. This complementarity was only statistically significant for smoking, which reduced by 0.7 cigarettes per person per day, equal to 18% of the mean. We investigate whether this change was attributable to the QOF by testing for other discontinuity points, including the introduction of a smoking ban in 2007 and changes to the QOF in 2006. We also examine whether medication and smoking cessation advice are potential mechanisms and find no statistically significant discontinuities for these aspects of health care supply. Our results suggest that a general improvement in healthcare generated by provider incentives can have positive unplanned effects on patients' behaviours.

1. Introduction

Major non-communicable diseases are the primary cause of death in developed countries. In Europe, the five major non-communicable diseases (diabetes, cardiovascular diseases, cancer, chronic respiratory diseases and mental disorders) account for 86% of deaths (WHO Europe, 2012). These diseases are generally chronic in nature, requiring long-term management. Best practice management and prevention uses both drug treatments and behaviour change interventions targeting smoking, alcohol consumption, diet and physical activity (NICE CG87, 2009; NICE CG181, 2014; NICE NG28, 2015).

The efficacy of this approach depends, in part, on whether receiving health care influences a patient's decisions to invest in health behaviours. Economic models of health production propose that both medical treatment and an individual's health behaviours are inputs in the production function for health capital (Becker, 2007; Grossman, 1972). The response of an individual to an increase in treatment provided by the health service depends on whether health care and health behaviours are substitutes or complements in the health production function.

From the individual's point of view, health behaviours are chosen at the level where the marginal costs equal the marginal benefits of effort. Because healthcare is an additional input, the optimal choice to the individual depends on what she believes about the joint productivity of the two inputs. On the one hand, the individual might believe that improved health care can raise the marginal productivity of her own health behaviour and decide to complement health care with additional effort in healthier behaviours. On the other hand, health care can lower the cost of unhealthy behaviours by compensating for their negative effects. Individuals may therefore reduce their effort in undertaking healthier

* Corresponding author.
    E-mail address: eleonora.fichera@manchester.ac.uk (E. Fichera).

lifestyles. The relative size of these two effects determines which one prevails over the other.

Kaestner et al. (2014) used a Becker-type health production model (Grossman, 1972) with multiple types of health investment to examine the effect of a reduction in the price of statins on health behaviours. Their model predicted an ambiguous relationship between statins and health behaviours. The direction of the effect depends on whether the pure income effect, leading to more consumption of both statins and healthier behaviours, prevails over the substitution effect.

Investigation of the causal effect of health care on health behaviours is difficult in observational settings because treatment is not assigned randomly. Disease, and the causes of disease, determine treatment assignment and may also influence health behaviours. Health behaviours influence disease occurrence and therefore treatment assignment, creating a selection bias if we compare treated and untreated samples.

A few studies have used instrumental variable models to overcome the treatment endogeneity problem. Kaestner et al. (2014) used the gradual penetration of statins in the U.S. market since their introduction in 1987 as an instrument for statin use. They used the Framingham Heart Study and found that statin use was associated with a small increase in Body Mass Index (BMI) and larger increases in the probability of being obese. They found that an increase in statins was associated with a 0.3–0.5 point increase in BMI for females and males and an increase of 15% of the mean in moderate alcohol consumption by males. Their results provide evidence for a strong substitutability of healthier behaviours and healthcare. However, they found no consistent evidence of a decrease in smoking as a result of statin use.

Fichera and Sutton (2011) used three cross-sections of the Health Survey for England to determine the effect of lipid-lowering drugs and smoking cessation advice on quitting smoking behaviour. In a trivariate probit regression they adopted an exclusion restriction involving the individual's level of cholesterol and type of heart disease. They found that prescription of lipid-lowering drugs increased the probability of smoking cessation by 20–28 percentage points in patients with cardiovascular diseases. However, the assumption of no direct effect of the type of heart disease on behaviour was not testable in cross-sectional data.

Schneider and Ulrich (2008) used two waves of the German Socio-Economic Panel Study to investigate the relation between the number of doctor visits and a patient's BMI and smoking behaviour. Although they found complementarity between the visits to the doctor and health behaviours, their identification strategy relied on a number of instruments (specifically stress, economic worries and a regional dummy for living in East Germany) to affect health behaviours but not healthcare utilisation.

In this paper we exploit an exogenous change in the provision of health care. This was caused by a change in the financial incentives for family doctors to provide treatment. These highly powered incentives, the Quality and Outcomes Framework (QOF), were initiated in April 2004 and aimed to improve the quality of primary care through financial rewards for achievement against a number of indicators of health care provision and health outcomes. We observe the effects of the QOF using data from the Health Survey for England (HSE) (1997–2009). This household survey gathers data on health behaviours and health status from repeated cross-sections of the English population.

We exploit the known date of introduction of the QOF with a regression discontinuity approach. We address treatment endogeneity in two ways: i) the introduction of the QOF induces a step change in treatment that is independent of individual's behaviour; and ii) as the interview date is independent of the QOF and the sample is randomly drawn from the population, so are the unobserved attitudes towards health of these individuals.

A systematic review by Gillam et al. (2012) reported that the QOF improved care quality with enhanced processes and intermediate outcomes for most of the health conditions that it targeted. In a Becker-type model such as the one by Grossman (1972), the value of a marginal investment in healthier behaviours has increased, because improved health care induces a higher probability of survival to enjoy the benefits. This is similar to the "competing risk of death effect" described by Kaestner et al. (2014). However, if healthcare and health behaviours are substitutes in health production then the model predicts lower investments in healthier behaviours. Kaestner et al. (2014) label this the "technical substitution effect". Therefore, the effect of the QOF-induced increase in the supply of healthcare on health behaviours is an empirical question.

We examine the effect of the QOF on three health behaviours (BMI, smoking and alcohol consumption) in a population of individuals with health conditions targeted by the QOF. We find evidence of complementarity between healthcare and healthier lifestyle choices with a statistically significant average reduction of 0.7 cigarettes per person per day (equivalent to 18% of the mean). We expose our analysis to a battery of robustness checks investigating the sensitivity of the results to the definition of the discontinuity point. Our main results remain unchanged.

We then attempt to determine some potential mechanisms through which the QOF has improved lifestyle behaviours examining the role of medication and smoking cessation advice, which are both measured in the HSE. We do not find any statistically significant discontinuities in medication and smoking cessation advice. This suggests that it was the wider improvements in health care induced by the QOF identified in previous studies (see for example, Gillam et al., 2012; and Sutton et al., 2010) that may have influenced individual's health behaviours.

The paper is structured as follows. The QOF is described in section 2. The data and descriptive statistics are outlined in section 3. Section 4 contains a graphical analysis. Section 5 describes the empirical strategy and section 6 discusses the results. Section 7 concludes.

2. The Quality and Outcomes Framework (QOF)

On the 1st of April 2004, the UK National Health Service introduced a new pay-for-performance scheme for family doctors. This new program, the QOF, encouraged improved treatment and management of specific conditions and increased doctors' incomes by 25% (Review Body, 2008).

Each financial year running from 1st of April, practices are rewarded on four quality domains: clinical, organisational, additional services and patient experience (Roland, 2004). Each domain contains several quality indicators. Achievement of these indicators provides practices with points, which are converted to income depending on the size of the practice population and disease prevalence rates. In the first two financial years of the program, the clinical domain contained up to 550 points. In 2004/05 the price per point was £75, offering a maximum of about £41,250 for an average practice. In 2005/06 the price per point was raised to £125 amounting to a maximum income of £68,750.

In this paper we consider seven disease areas and 18 performance indicators present in the QOF since its introduction in 2004/05 (see description in Table A.1). These indicators accounted for 25% (139/550 points) of the total reward available for clinical care up to 2005/06. Although from the 1st of April 2006 the total number of QOF points changed as new indicators were introduced, the proportion of total points available for our incentivised indicators remains unchanged.