RESEARCH

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# EDUCATION, TRAINING AND THE TAKE-UP OF PREVENTATIVE HEALTH CARE

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**Introduction:**

This research investigates the relationship between education and the take-up of preventative health care, with particular reference to screening for cervical cancer.

Data from the BHPS (British Household Panel Survey) is used to predict the levels of screening uptake on the basis of women's qualification levels and to analyse the effects of participation in adult learning in changing the probability of take-up of screening. The data covers women who were eligible for a cervical smear test between 1991 and 2002; that is women aged 25 to 56 in 1991. The analysis forms part of an assessment of the potential benefits of education in terms of possible cost-savings via health service utilisation.

**Key Findings**

- Prior learning, measured by highest educational qualifications on completion of full-time education, is positively associated with the uptake of screening.
- We find a threshold in the effect of education. Women with educational qualifications at Level 2 or above have a higher probability of having three or more screenings in 11 years than women with qualifications below Level 2. Effects of Level 3 or Level 4 and above are similar to the effects of having Level 2 qualifications. This finding is relevant to current policies that aim to increase qualifications to Level 2.
- The effect of educational qualifications on the uptake of screening remains statistically significant even after the inclusion of health controls, personal factors, confounding variables and factors that may channel any educational effects. We estimate that women with educational qualifications above Level 2 have a 5.7 percentage point higher probability of having more than two cervical smear tests in 11 years. They also have a 2.8 percentage point lower probability of not having any test in 11 years.
- It is likely that the effect of prior learning represents a selection bias but it is noteworthy that the difference remains even after controlling for parental SES and that women's income and SES do not pick up the same selection bias effect. Therefore, we conclude that education is the dominant socio-economic determinant and one deserving of greater policy and research focus in the practice and study of the take-up of preventative care.
- Using a model to predict changes in the levels of uptake of screening, we find that doing adult learning, measured as an indicator of whether women had re-entered full-time education, or had taken any education, training schemes or courses as part of current and past employment, or were enrolled in any government training schemes, the Open University or correspondence courses, is associated with a 2.2 percentage points increase in the probability of utilising screening. This result holds after the inclusion of screening histories, health controls, socio-demographic and economic variables, time-invariant unobservable factors, period and regional effects.
- Lack of information on time-varying elements that may affect education and uptake of health services, such as self-efficacy and motivation, imply that the associations found here may not reflect effects of education. Nevertheless, different tests for sensitivity indicate that educational associations with preventative health care are robust.
- Based on our estimates, for each additional 100,000 women in adult learning we expect between 116 and 152 cancers prevented if the effect is causal.

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**A theoretical framework**

Education can enhance the demand for preventative health services for several reasons. Education has a direct effect on preventative health by raising awareness of the importance of undertaking regular health check-ups and hence the willingness to do so. Education may also improve the ways in which individuals understand information regarding periodical tests, communication with the health practitioner, and the interpretation of results.

Education improves accessibility to services if it enhances the inclusion of individuals in society and provides the means and incentive for individuals to know and demand their rights to receive health care from the government. Even with public provision of health services, access is biased towards the better educated groups, who possess superior information about and greater willingness to claim their entitlements.

Other mechanisms by which education may affect the take-up of preventative health are efficacy and confidence. Education increases individuals' efficacy – their power to take control of their lives – and self-confidence, empowering them over future choices, including the choice to undertake periodic health tests. Education can also improve access to health services by increasing patience and motivation. Patience enhances demand for preventative health care by lowering the discount rate on future ill-health, hence placing a higher valuation on prevention today than on ill-health tomorrow. Motivated individuals maintain better health through positive attitudes to life and regular health check-ups.

Let us approximate the effects of education on preventative health service utilisation by the function *f*, such that:

$$S_{it} = f(Ed, X, Y, \alpha_i, \lambda_t, \eta_{it}) + e_{it} \qquad (1)$$

where *i* denotes individuals and *t* stands for time. *S* denotes uptake of service, which is a function of education (*Ed*). **X** is a matrix of individual, demographic characteristics such as age, sex, income, and marital status among others. **Y** is a matrix of variables that affect access to services such as social context, distance from the clinic, average waiting times and so on. Individual time invariant fixed effects are denoted by $\alpha_i$; period heterogeneity that affects all individuals in a particular year, $\lambda_t$; time-varying individual heterogeneity in service utilisation such as changes in self-efficacy, $\eta_{it}$. Measurement error is captured by $e_{it}$.

We hypothesized that the main channels for the relationship between health resource utilisation and education are social inclusion, self-efficacy, confidence, motivation and patience. The effect of education on the demand for preventative health services estimated by this model will measure the aggregate effect, or combined effect, of education through each of the main channels.

**Methodology for the effects of prior learning**

Three categories are generated to summarise 11 years of reported cervical smear tests for women aged 25 to 56 who always participated in the BHPS. The first group includes women who did not have any smear test in 11 years. The second group consists of women who had one or two smear tests in 11 years and the third group contains all women who had three or more smear tests in 11 years. This categorisation implies that having one or two preventative tests in 11 years is better than having none; and having three or more is better than having one or two. Hence, there is an implicit ordering in the outcome variable.

Prior learning is measured by the highest educational qualifications attained. Educational qualifications in the BHPS are converted to an equivalent NVQ level. We perform step-wise regressions. This process works by estimating the effects of prior learning on the take-up of smear tests in 11 years using controls that are not correlated with education. We then include income and employment variables and analyse how the effect of education on screening changes as a result of adding these controls into the model.

Including these variables in equation (1) requires careful interpretation. Income and employment may be independent sources of effects on preventative care that provide alternative policy levers. However, they may also be channels for the effects of education. Step-wise regressions allow us to assess which socio-economic variables are significant determinants of the uptake of screening. That is, we would like to determine which of the features of socio-economic status matters for screening, whether it is income, class, occupation, employment or education.

We employ an ordered probit to estimate the parameters of the model. Parameters are interpreted

as increasing or decreasing the likelihood that women belong to each of the ordered categories; having no smear tests, having one or two smear tests, or having more than two smear tests in 11 years. In order to assess the mediating effects of prior learning we perform the last estimation for different sub-groups of the population (sensitivity analysis). Finally, we calculate marginal effects to quantify the impact of the explanatory variables on the probability of each outcome (belonging to each category).

**Methodology for the effects of continuing adult learning**

Our outcome variable is an indicator of the take-up of cervical screening in year *t*. This indicator takes the value of '1' if a smear test occurred. Our policy variable for the second analyses is continuing adult learning. This variable takes the value of '1' if during year *t* women re-entered full-time education, or had taken any education, training schemes or courses as part of current and past employment, or were enrolled in any government training schemes, the Open University or correspondence courses.

The panel structure of the data allows us to control for some of the unobserved heterogeneity which we described in equation (1) as $a_i$, $\lambda_t$, and $\eta_{it}$. The first type of unobserved heterogeneity, $a_i$, is individual time-invariant. An example of this type of heterogeneity is stable personality traits, which regardless of the year of the interview will be the same for each individual. Time-invariant unobserved heterogeneity can be dealt with in the empirical model using fixed or random effects.

The second type of unobservable heterogeneity is cross-sectional individual-invariant factors, $\lambda_t$, which affect equally all individual observations in one period but not in others. An example of this type of heterogeneity will be the introduction of a national policy that may affect uptake of screening in Britain. It is relatively straight-forward to model this heterogeneity by introducing one indicator variable for each period in the panel data.

The last type of heterogeneity that we consider is individual time-varying heterogeneity, $\eta_{it}$. An example of this type of unobservable variable is motivation or self-efficacy, features of the individual that may contain stable elements but also elements which can be assumed to change over time. In these data there are no measurements of these variables so we have no other option than to assume that the effect of the unobserved individual time-varying heterogeneity has the property of a random variable. Therefore, we do not model explicitly this time-varying heterogeneity but assume that it is incorporated in the error term. We explain the implications of ignoring this type of heterogeneity below in the section on the limitations of the model.

Another issue to address is the sequencing of the events of adult learning on the uptake of screening and the implications of this for estimation of effects. Women reported whether adult learning and screening occurred within the year previous to the interview. However, we do not know whether adult learning within that year happened before uptake of screening or *vice versa*. One way to approach this issue is by estimating whether adult learning in the previous period had an effect on the current uptake of screening. Using past adult learning as a predictor of current screening in this way, however, assumes that adult learning has lasting wider effects on individuals' health choices. We are forced to choose between alternative debatable assumptions and approach the problem by estimating both models and using the range of estimates provided to assess the likely education effect.

The estimation strategy is as follows: First we estimate a model ignoring the cyclical structure of cervical screening, introducing prior learning and adult learning as two of our main explanatory variables, together with health controls, time constraints, other socio-economic determinants and demographic characteristics. We describe the results from this model and from a model that includes lagged values of adult learning. These models are each estimated using first a random effects probit model and secondly a fixed effect logit model (a.k.a. conditional logit model).

Then we introduce past information on screening to predict current screening. With this approach our aim is to capture part of the variation in the outcome variable by its past values. If sufficient variation exists in the model after the inclusion of past screening we should be able to pin down the explanatory variables that remain significantly associated with screening.

As for the case of prior learning, we perform sensitivity analysis and calculate marginal effects. Additionally, we utilise marginal effects to calculate the effect of adult learning on cancer prevention. For this, we draw on information from the Cancer

Screening Programme on the probability of cancer prevention. We use confidence intervals to estimate the range of cancer prevention.

**Findings on the effects of prior learning**

Our main finding is that education is associated with the uptake of cervical screening, even after the inclusion of factors that channel educational effects such as income, socio-economic status and occupation.

We find a threshold in the effect of education. Women with educational qualifications at Level 2 or above have a higher probability of having three or more screenings in 11 years than women with qualifications below Level 2. Estimated parameters indicate that the effects of Level 3 or Level 4 and above are similar to the effects of having Level 2 qualifications. This finding is relevant to current policies that aim to increase qualifications to Level 2.

Even though we estimate a significant association of education on the uptake of screening net of parental SES, we do not disregard the possibility that we may be capturing the effect of other unobservable individual characteristics which affect both access to resources and education itself, such as self-confidence, motivation, patience and self-efficacy. The omission of these variables will bias upwards the estimate of the effect of education. However, these factors should also be proxied for or related to parental SES so the non-significance of the SES variables suggests that the associations found between take-up of smear tests and education is picking up a causal effect of education.

Other studies have shown an insignificant relationship between education and the uptake of screening. Our results contradict these findings. An explanation for this may be that the controls included in these studies are themselves mediators of the effects of education, such as income, occupation, poverty or class. An insignificant association between education and service uptake does not mean that education does not matter at all, but simply that after such controls are included the educational effect is knocked out.

However, results from this model do not make full use of the panel structure of the data and hence some interesting questions are not being addressed here. One of these regards the effects of adult learning on the uptake of screening. Also, screening in the UK follows a cycle, and this information has not been properly accounted for in a static model. Finally, some variables change over time, and it is important to assess whether changes in these variables, for instance deteriorating health status, have statistical relationships with uptake of screening.

**Findings on the effects of continuing adult learning**

First we estimate a model to predict screening ignoring its cyclical structure. Results from this model indicate that adult learning is associated with the uptake of screening. In other words, there is a positive association between women enrolled in adult learning and their uptake of cervical screening. We discuss below the likelihood that the effect is causal. Note, too, the finding that if we look at the effects of adult learning lagged one year we find no effects. This suggests that if the effect is causal it is rather temporary. However, one should bear in mind that the definition of adult learning being applied here is extremely general, referring to a great range of different courses, of different durations (from 1 day to 1 year), taken for very different reasons and with very different pedagogies, peer groups and qualifications.

Other interesting results indicate the importance of cultural barriers for service uptake; this being captured by the negative and significant parameter of ethnicity. We also find that poor self-reported health is associated with greater uptake of screening, although the explanation for this association does not lie with self-reported health per se but rather with the association between poor self-reported health and visits to the GP. We also find that changing location is associated with the uptake of screening. Finally, we show that having children under five, full-time employment and living in regions where waiting times for the GP are higher than the average for England are each associated with a lower probability of having a smear test.

Our last set of estimations include past screenings as predictors of current screening. Again, adult learning remains statistically associated with the uptake of screening. For this set of estimations the marginal effect indicates that doing adult learning is associated with a 2.2 percentage points increase in the probability of having a smear test.

This can be thought of as an effect of adult learning under two assumptions. First, that there can be no reverse causality operating (since screening and learning occur simultaneously in our data.) One must assume therefore that the association cannot be

caused by an effect of screening on participation in learning. This seems to us a reasonable assumption. The second and more problematic possibility is that unobserved time-varying heterogeneity causes both adult learning and screening. Our methods are not robust to this possibility.

However it is worth emphasising that when we translate our results for adult learning into prevention of cervical cancer we find that between 116 and 152 cancers would be prevented for every 100,000 women in adult learning. The number is relatively small because the learning experiences observed were not systematically related to the intention to prevent cancer.

Moreover, the channel for cancer prevention is through take-up of screening and so there are a number of intermediary and low probability events in between learning and cancer prevention. Nevertheless the finding that between 116 and 152 cancers would be prevented per learning episode is quite large in epidemiological terms and, if causal, is remarkable given that the benefit is entirely unexpected and not the cause of learning participation, in other words it is a great added-value or externality

Furthermore, the only preventative measure assessed here is cervical cancer screening. If there are indeed effects of learning for women on this outcome there are likely to be effects for all on a greater range of preventative measures in which case the public health benefit may be extremely substantial indeed.

We take this finding to mean that adult learning may have important extra benefits for society. However, because of the estimation problems described we cannot be sure that this is a genuine effect. A true assessment of causality can be obtained by conducting randomised control trials. We acknowledge that there are ethical and practical issues in relation to randomised control trials. We do not discuss them here. However, in the absence of this evidence, this paper does not claim causality of reported effects.

**Policy relevance**

This project is embedded in a contemporaneous concern regarding health provision in Britain. One of the top priorities of the British government has been to provide and to secure access to high-quality health services for the population. The Wanless reports in 2002 & 2004 suggest that the government's strategy is based on improvements to the supply of health services and on reductions in the demand for health care.

The supply for health services can be improved by increasing the productivity of National Health Service (NHS) staff, buildings and with the introduction of new technologies. At the same time, reductions in the demand for health care should be induced by preventative measures such as health promotion initiatives. Thus, the NHS should be seen not only as a curative service but also as a prevention service to promote the health of the nation. This highlights the personal responsibility of the individual to look after their own health as far as possible. Part of the individual responsibility is to take advantage of the national health provision, including preventative care.

Our project's aim is to inform a cutting edge policy issue. We hypothesise that socio-economic factors influence women's demand for preventative health services. We therefore investigate the effects of education, as well as other variables, on the probability that women undertake a smear test when they should. Public policy should aim to stimulate women's demand for this and other forms of preventative health care. We propose that education is one of the factors that affects this demand.

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