

**Impact case study (REF3b)**

<p><b>Institution:</b> Imperial College London</p>
<p><b>Unit of Assessment:</b> 01 Clinical Medicine</p>
<p><b>Title of case study:</b> Introduction of Mass Screening by Once-Only Flexible Sigmoidoscopy in the English Bowel Cancer Screening Programme to Reduce Colorectal Cancer Incidence Rates</p>
<p><b>1. Summary of the impact</b> (indicative maximum 100 words)</p> <p>Research undertaken by Professor Atkin has identified a feasible, acceptable and cost-effective method of reducing colorectal cancer incidence and mortality rates, which involves a once-only flexible sigmoidoscopy screening for all men and women at around age 60. The supporting research involved publishing the evidence, developing a fail-safe, efficient, patient-friendly delivery system, developing a surveillance strategy following adenoma-removal, and testing in multicentre randomised trials. After 11 years, incidence and mortality rates were reduced profoundly in the trials, with no observed attenuation of effect. The entire screening strategy was rolled out in a national programme from 2013, with complete population coverage expected by 2016.</p>
<p><b>2. Underpinning research</b> (indicative maximum 500 words)</p> <p>Key Imperial College London researchers:          Professor Wendy Atkin, Professor of Gastrointestinal Epidemiology (St Mark's Hospital, Imperial Category C, 1989 –2008; Category A 2008 - present)          Professor Brian Saunders, Adjunct Professor of Endoscopy (St Mark's Hospital, Imperial Category C. 1997 – present).</p> <p>In 1993 Professor Atkin hypothesised that a once-only flexible sigmoidoscopy (FS) undertaken at around age 60 years, with removal of detected adenomas, would provide substantial and enduring protection against the development of colorectal cancer (CRC). Evidence supporting this hypothesis was published by Professor Atkin and colleagues, with a call for a randomised controlled trial (RCT) to test the idea (1). In the following years, Professor Atkin undertook two parallel strands of research with independent yet related goals: first, she designed and performed a multicentre RCT to test this hypothesis, and second, she assessed the feasibility of delivering a nationwide FS based screening programme in the future.</p> <p>In 1993 Professor Atkin performed a small feasibility study involving 4000 people (2) and a subsequent pilot trial with 16000 people was undertaken in 1995. Finally, in 1996 a UK wide multicentre RCT, the UK Flexible Screening Sigmoidoscopy Trial (UKFSST), was initiated, involving 170,000 people.</p> <p>Whilst testing her hypothesis, Professor Atkin planned and established the fail-safe, efficient, patient-friendly processes necessary to invite, screen and follow-up the whole population; instituted a population demonstration project in two areas of London (including a deprived, ethnically diverse region) that utilised specially trained nurse practitioners to perform FS (she worked with the profession to develop the training programme in its early phase); ensured that the UKFSST trial was performed in a manner and at a pace that would be identical to a future screening programme; and developed guidelines for surveillance strategies following adenoma removal that were adopted by the existing Bowel Cancer Screening Programme, that demonstrated that half of people with adenomas are low risk and do not need surveillance (thus ensuring a future screening programme that would be economically viable). Throughout this time, research results were continually disseminated as high profile, high impact publications, and independent, international corroboration for Professor Atkin's trial protocol was obtained when it was used by the Italian SCORE (<b>S</b>creening for <b>CO</b>lon <b>R</b>ectum) trial. The Norwegian NORCCAP (<b>NOR</b>wegian <b>CO</b>lorectal <b>CA</b>ncer <b>P</b>revention) trial has also utilised parts of the UKFSST trial strategy (once-only FS and the same participant age-range) and the results are due to be presented shortly.</p> <p>In 2002, baseline results of screening in the UKFSST and Italian SCORE Trial were published (3-</p>

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4). In 2002, Professor Atkin and Professor Saunders developed the first UK guideline on colonoscopic surveillance for people with colorectal adenomas (5): the guideline was adopted as the UK standard. In 2010, the first results of the UKFSST were published (6). The trial demonstrated that 11 years after a single FS screening, undertaken in men and women between ages 55 and 64, CRC incidence was reduced by a third and mortality by 43%. This was the first empirical demonstration that removal of adenomas reduces CRC incidence and the effect was substantial and long-lasting: no attenuation was observed over 11 years' follow-up. FS was shown to be a feasible, acceptable and cost-effective method of reducing CRC incidence and mortality, and Professor Atkin had demonstrated a model for delivery of FS screening that was of high quality in terms of safety and yield of significant neoplasia.

From 1989 to 2008, Professor Atkin was based at St Mark's hospital, where she held an honorary position (Category C) with Imperial College initially as Senior Lecturer, rising to Professor in 2004. In 2008 Professor Atkin relocated to the St Mary's Hospital campus as Professor of Gastrointestinal Epidemiology (Category A).

The underpinning research that led to this impact involved collaboration with a number of institutions. Professor Atkin conceived of the idea, published the hypothesis, designed and managed the trials and procedures, and wrote many papers detailing the interim results and reviewing on-going research and competing methodology in the field. Professor Jane Wardle and her team at the Health Behaviour Research Centre at UCL undertook all health psychology aspects of the trial, and 14 trial centres around the UK screened the patients.

**3. References to the research** (indicative maximum of six references)

- (1) Atkin, W., Cuzick, J., Northover, J.M., & Whynes, D.K. (1993). Prevention of colorectal cancer by once-only sigmoidoscopy. *Lancet*, 341 (8847), 736-740. [DOI](#). Times cited: 273 (as at 6<sup>th</sup> November 2013). Journal Impact Factor: 38.28.
- (2) Atkin, W., Hart, A., Edwards, R., McIntyre, P., Aubrey, R., Wardle, J., Sutton, S., Cuzick, J., & Northover, J.M.A. (1998). Uptake, yield of neoplasia, and adverse effects of flexible sigmoidoscopy screening. *Gut*, 42 (4), 560-565. [DOI](#). Times cited: 94 (as at 6<sup>th</sup> November 2013). Journal Impact Factor: 10.11.
- (3) Atkin, W. *et al.* (2002). UK Flexible Sigmoidoscopy Screening Trial Investigators. Single flexible sigmoidoscopy screening to prevent colorectal cancer: baseline findings of a UK multicentre randomised trial. *Lancet*, 359 (9314), 1291-1300. [DOI](#). Times cited: 294 (as at 6<sup>th</sup> November 2013). Journal Impact Factor: 38.28.
- (4) Segnan, N., Senore, C., Andreoni, B., Aste, H., Bonelli, L., Crosta, C., Ferraris, R., Gasperoni, S., Penna, A., Risio, M., Rossini, F.P., Sciallero, S., Zappa, M., Atkin, W.S. and SCORE Working Group - Italy. (2002). Baseline findings of the Italian multicenter randomized controlled trial of "once-only sigmoidoscopy" -SCORE. *J Natl Cancer Inst*, 94 (23), 1763-1772. [DOI](#). Times cited: 140 (as at 6<sup>th</sup> November 2013). Journal Impact Factor: 13.76.
- (5) Atkin, W.S., Saunders, B.P. (2002). Surveillance guidelines after removal of colorectal adenomatous polyps. *Gut*, 51 (Suppl 5), V6-9. [DOI](#). Times cited: 81 (as at 6<sup>th</sup> November 2013). Journal Impact Factor: 10.11.
- (6) Atkin, W.S., Edwards, R., Kralj-Hans, I., Wooldrage, K., Hart, A., Northover, J.M.A., Parkin, D.M., Wardle, J., Duffy, S.W., & Cuzick, J. (2010). Once-only flexible sigmoidoscopy screening in prevention of colorectal cancer: a multicentre randomised controlled trial. *Lancet*, 375(9726), 1624-1633. [DOI](#). Times cited: 351 (as at 6<sup>th</sup> November 2013). Journal Impact Factor: 38.28. This paper was the most frequently cited paper in *The Lancet* in 2010 and was shortlisted, with two other papers, for the BMJ group "Research paper of the year" award.

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## Key funding:

- KeyMed Ltd (Industry endoscope provider; 1994-1995; £511,116), Principal Investigator (PI) W. Atkin, Feasibility study for flexible sigmoidoscopy.
- Cancer Research UK (CRUK; 2006-2008; £624,197), PI W. Atkin, Colorectal Cancer Unit
- CRUK (2008-2013; £1,309,275), PI W. Atkin, Screening and Prevention of Colorectal Cancer.
- Medical Research Council (MRC; 1996-2000; £2,064,199), PI W. Atkin, Multicentre randomised trial of 'once-only' flexible sigmoidoscopy screening for prevention of colorectal cancer morbidity and mortality.
- MRC (2001-2005; £739,920), PI W. Atkin, Flexible sigmoidoscopy extension 1.
- MRC (2006-2010; £752,716), PI W. Atkin, Flexible sigmoidoscopy extension 2.
- National Institute for Health Research (2011-2016; £721,408), PI W. Atkin, FS extension 3.
- KeyMed Ltd and Department of Health, Cancer Screening Programmes (2003-2009; £490,468), PI W. Atkin, Population flexible sigmoidoscopy screening: evaluation of feasibility of a high-uptake nurse-led service.

**4. Details of the impact** (indicative maximum 750 words)

Impacts include: health and welfare, public policy and services, practitioners and services, society  
Main beneficiaries include: patients and the public, NHS, Department of Health, international health service providers

There are one million new diagnoses of CRC annually worldwide. It is the third most commonly diagnosed cancer and the second most frequent cause of cancer death in the UK and it is estimated that it costs the NHS in excess of £1 billion annually. Only five months after publication of the results of the UKFSST in October 2010, Prime Minister David Cameron announced a £60m investment over four years to incorporate FS screening at around age 55 into the current nationwide Bowel Cancer Screening Programme [1]. The rapid decision to provide funding for incorporation of the FS screening strategy in Bowel Cancer Screening Programme, was based on recognition that the UK lags behind other EU countries in terms of CRC mortality rates, and that the once-only FS screening strategy was seen as a way to catch up with better performing countries. A model of delivery had already been developed and tested in a demonstration pilot in a deprived and ethnically mixed population in London, and the processes needed to invite, screen and follow-up the entire population had been established (the Bowel Cancer Screening System was subsequently modified by Connecting for Health to incorporate Professor Atkin's model for delivery of FS screening for use in a nationwide screening programme). From published research, it was evident that FS screening was a feasible, acceptable and cost-effective method of reducing CRC incidence and mortality rates, and independent research had shown that once only FS was cost saving.

The 2011 NICE Colorectal Cancer guidelines recommend that FS be offered to patients with major comorbidity [2; see page 8]. The EU guidelines for colorectal screening and diagnosis state that 'flexible sigmoidoscopy (FS) screening reduces CRC incidence and mortality if performed in an organised screening programme with careful monitoring...' [3]. US guidelines recommend that FS is used as one of the screening approaches for men and women over the age of 50 [4]. In its first annual report for improving outcomes in cancer, the Department of Health stated that improving sigmoidoscopy activity was a key priority for next year, stating 'introduction of flexible sigmoidoscopy bowel screening and the move to more investigations of symptomatic patients mean that a key priority for next year is to increase endoscopy activity' [5; see point 3.46 on page 43].

FS screening was approved by the UK National Screening Committee in 2011 [6], and the English NHS Bowel Cancer Screening Programme initiated Pathfinder FS projects between January and May 2011. The organisation and bidding process, including development of the English database, was initiated in 2012 [7]. Roll-out of a pilot programme began in March 2013, and roll-out of the first wave of the full programme (wave 1 of 3) was subsequently initiated in October 2013, with the aim

of achieving 30% coverage by 2014, 60% by 2015 and full population coverage within England by 2016.

The immediate beneficiaries of these impacts are the UK population: from the UKFSST findings it has been calculated that FS screening at age 55 would prevent 5,000 CRC diagnoses and 3,000 deaths in the UK each year, and rectal cancer could be rendered a rare disease as FS is so effective in this region. Potential beneficiaries in the longer term include high incidence countries in the EU and North America where the guidelines for early detection of CRC have been recently revised, to include reference to our work. . The delivery of screening strategy outcomes in England should facilitate adoption by other countries and this may eventually prevent the majority of deaths from distal CRC: evidence from the US that CRC incidence rates in the distal colon are already falling dramatically as a result of colonoscopy based screening further supports these efforts.

#### 5. Sources to corroborate the impact (indicative maximum of 10 references)

- [1] Public Health England. NHS Bowel Cancer Screening news. "Flexible Sigmoidoscopy to be introduced into the NHS Bowel Cancer Screening Programme". <http://www.cancerscreening.nhs.uk/bowel/news/006.html>. Archived on 6<sup>th</sup> November 2013.
- [2] NICE Clinical Guideline. Colorectal cancer: the diagnosis and management of colorectal cancer. Full Guidelines (November 2011), pages 1-186 (refer to page 8 for list of recommendations). Recommends that flexible simoidoscopy is offered to patients with major comorbidity. <http://www.nice.org.uk/nicemedia/live/13597/56957/56957.pdf>. Archived on 6<sup>th</sup> November 2013.
- [3] EU Guidelines for quality assurance in colorectal cancer screening and diagnosis (2011). Refer to page 4. The Atkin trial is cited in section 1.7. Archived on 6<sup>th</sup> November 2013.
- [4] American Society Guidelines for the early detection of cancer: colorectal cancer and polyps. <http://www.cancer.org/healthy/findcancerearly/cancerscreeningguidelines/american-cancer-society-guidelines-for-the-early-detection-of-cancer>. Archived on 6<sup>th</sup> November 2013.
- [5] Department of Health. Improving outcomes for cancer: First Annual Report (2011). <https://www.gov.uk/government/publications/the-national-cancer-strategy-first-annual-report> (see point 3.46 on page 43). Archived on 6<sup>th</sup> November 2013.
- [6] UK National Screening Committee. <http://www.screening.nhs.uk/cms.php?folder=3057>. Archived on 6<sup>th</sup> November 2013.
- [7] NHS Bowel Screening Programme. Piloting Flexible Sigmoidoscopy. Advice to the NHS and bidding process. January 2012. <https://www.gov.uk/government/publications/piloting-of-flexible-sigmoidoscopy-advice-to-the-nhs-and-bidding-process>. Archived on 6<sup>th</sup> November 2013.