**Planned Patient & Public Involvement (PPI):**

I’m looking to incorporate PPI in the setup and running of a new research project (see project summary below). In particular, I am looking for a few patients and members of the public who have experience of the NHS screening programmes for colorectal cancer.

The project will be a PhD and will run for 3 years at the Centre for Statistics in Medicine (CSM) at the University of Oxford. In these three years, I would like patients and members of the public to be part of an advisory group that meets once or twice a year for approximately 2 hours (location can be discussed, but presumed at the University of Oxford) to discuss the progress of my research and the forthcoming goals. Reimbursement for travel expenses will be provided. I would like patients and members of the public to review the dissemination of outputs that come out during the running of the project. This includes reviewing any manuscripts for publication, presentations, etc.

**Project summary:**

**Background:**

Colorectal cancer is the fourth most common type of cancer in the UK. There were around 41,300 new cases in the UK in 2014, that’s 110 cases diagnosed every day. It is the second most common cause of cancer-related death in the UK. There were around 15,900 colorectal cancer deaths in the UK in 2014, that’s 44 deaths every day. This type of cancer can develop slowly for years and is often unnoticed until patients start showing symptoms of illness. At this point, the cancer has usually developed to a stage where it is difficult to treat and the patient is more likely to die due to severe cancer. Detecting the cancer at an earlier stage may either cure cancer or prevent it developing.

**Approaches to detect colorectal cancer:**

Currently, screening is the route that diagnoses most cases of colorectal cancer early on. With that being said, only 48% of cases cases are diagnosed at an early stage and screening is only routinely offered to those 60-75 years of age. Additionally, response to screening invitations is less than 60%. There is a clear need for an alternative approach to detect colorectal cancer, one which detects more cases of the cancer early on. Such an alternative has recently been developed and tested in Israel, a statistical early detection tool which uses blood values from blood tests to predict the likelihood of a patient being diagnosed with colorectal cancer; it is known that decrease in haemoglobin is predictive of colorectal cancer. In the UK, blood values are easily available via medical records and tend to be recorded many times through a person’s life. Values potentially dating years prior to diagnosis could prove beneficial for early detection. This tool has recently been re-created and tested for the UK population.

**The problems:**

The recently-developed early detection tool is sub-optimal and may not work reliably due to important statistical aspects not considered during the development stage. One of these is that the tool only looks at one set of blood values and does not consider how they change over time. This is important as behaviour over time could reflect the presence of disease before diagnosis. Another is that the tool contains all blood levels that are routinely recorded (e.g. haemoglobin, white blood cells, etc.) and does not consider how these values are related to each other. One common consequence of this is that the tool will appear to be working well, although in reality it is not. A useful indicator would be the time it takes to be diagnosed with colorectal cancer, which the tool does not provide.

**Methods:**

I will use statistical techniques to generate a reliable early detection tool for colorectal cancer among the UK population. I will investigate which blood levels are predictive of colorectal cancer and, by using all occurrences of blood values available in a patient’s record, how change in the blood values over time improves prediction.

**Main goal:**

There is a clear need to resolve the problems and optimise the early detection tool to prevent missed diagnoses and false detections of colorectal cancer. We have an opportunity to correct this tool now, very soon after its development, before it enters clinical practice and become a standard tool. To do this, my investigations will be key. This research has the potential to save many lives through a more informative and reliable early detection tool for colorectal cancer.