Cancer Outcomes in UK Biobank

Workshop report
July 2012

BREAST CANCER BREAKTHROUGH

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Executive Summary

UK Biobank is a major, prospective, epidemiological study into the diseases of middle and older age. Since recruitment began in 2006, the project has created a database of person-level data for 500,000 adults aged 40-69, including annotated biological samples, and self-reported lifestyle and behavioural information. UK Biobank participants have also consented for this wealth of data to be linked with their routinely collected medical and health-related records. This additional information will strengthen UK Biobank as world-leading resource allowing for a diverse range of research into improving the prevention, diagnosis and treatment of the illnesses of later life.

The National Cancer Intelligence Network (NCIN), in association with Breakthrough Breast Cancer, Cancer Research UK, the Medical Research Council (MRC) and the Wellcome Trust, brought together cancer researchers and other interested parties from throughout the UK to discuss the research potential the data held by UK Biobank. Five key areas of emerging research were discussed by principal investigators, senior academics, research funders, industry partners and patient representatives. This paper summarises the discussions and draws conclusions about how the NCIN and UK Biobank could work in partnership to enhance the UK Biobank resource and future proof its data for use in cancer research.

Summary of outcomes:

1. There is considerable interest within the cancer research community in using the UK Biobank as a resource for understanding the causes and development of cancers.

2. UK Biobank has planned a number of enhancement activities to enhance the database; including data linkage to routinely collected vital events, cancer registrations, hospital admissions and, in due course, primary care data. UK Biobank is also in the process of establishing an assay panel of established biomarkers with cross-disease relevance to be conducted on all participants. Attendees felt these activities were positive enhancements to the current resource.

3. Expert groups are currently working with UK Biobank to confirm diagnoses of UK Biobank participants and determine precise classifications of sub-types of disease, starting with cancers, diabetes, heart disease and stroke. The NCIN should continue work with UK Biobank to provide the required information about cancer cases among the UK Biobank participants by obtaining information from the cancer registries.

4. UK Biobank should investigate the feasibility of developing either a physical or virtual collection of resection blocks and histopathological slides from participants diagnosed with cancer.

5. UK Biobank should explore links with other cohort studies or prospective collections of data or samples (for example the 1958 British Births Cohort study or research tissue banks) which may have overlapping participants.

6. UK Biobank should set criteria for when to carry out whole genome analysis of the material in the existing collection, based on the number of disease cases in the cohort, and the cost and quality (fidelity) of the analysis

The NCIN would like to thank UK Biobank, Breakthrough Breast Cancer, Cancer Research UK, the Medical Research Council and the Wellcome Trust. We would further extend our thanks to Chairs Maggie Wilcox and Professor Sir Alex Markham, as well as Dr Helen Coleman, Dr Andy Hall, Dr Tim Key, Dr Nicholas Osborne and Dr Bridget Wilkins for their help in facilitating the breakout group discussions.

1.1 Introduction

UK Biobank (www.ukbiobank.ac.uk) is a long term, prospective, epidemiological study into the diseases of middle and older age, aiming to follow its participants for several decades[1]. It will provide an important resource for many future investigations of the separate and combined effects of genetic, environmental and lifestyle factors on human morbidity, mortality and health.

The study, funded by the Department for Health, North West Regional Development Agency, Medical Research Council, Scottish Government, Wellcome Trust and Welsh Assembly has recruited a representative sample of 500,000 individuals aged 40 to 69. This particular age range was selected as it represents those individuals where the most common disease phenotypes occur at a frequency high enough to generate sufficient incident cases for meaningful analysis within the next 5–10 years. Self-reported baseline data on lifestyle and behavioural factors, and other relevant environmental exposures were collected on all participants. In addition, participants underwent a range of physical measures and donated a total of more than 15 million aliquots of specimen samples (blood, urine and saliva). Participants also provided consent to general and enduring access to their medical records and health-related records so that subsequent GP visits, hospitalisations and deaths could be followed.

The National Cancer Intelligence Network (NCIN), in association with Breakthrough Breast Cancer, Cancer Research UK, the Medical Research Council (MRC) and the Wellcome Trust, convened a one-day workshop in July 2012 to look at opportunities for cancer research in UK Biobank. In addition to informing the delegates about the potential of this resource, the workshop set out to define the data needs of the cancer community to conduct innovative research within UK Biobank. The NCIN will work with UK Biobank to try to provide the required information about cancer cases among the UK Biobank participants by obtaining information from cancer registries and other sources.

Session 1

Maggie Wilcox (Independent Cancer Patient Voices) welcomed participants and highlighted the need for practical and collaborative strategies to enhance UK Biobank. The workshop was described as an opportunity both to learn more about the resource and to help the NCIN explore a number of general questions regarding the adjudication of cancer outcomes and the enhancement of the UK Biobank resource. The workshop opened with a series of presentations on the development and current status of UK Biobank to provide context for the afternoon's group discussions.

1.2 Presentations

Dr Tim Peakman, Deputy Chief Executive of UK Biobank, summarised the study protocol and current status of UK Biobank. In designing the study protocol a number of lessons were learnt from similar cohort studies typically characterised by small numbers of disease cases; incomplete or inadequate measures of potential risk factors (which may yield systematic under-estimates of disease associations); incomplete or inadequate measures of confounding factors (which may yield over- or under-estimates); and/or retrospective case-control designs in which the disease itself may influence risk factor levels. These issues have been addressed by UK Biobank to ensure it is fit for purpose.

The 500,000 UK Biobank participants were invited to one of 22 recruitment centres based in large UK cities. Here, the UK Biobank questionnaire was administered in two parts: a touch-screen self-completed questionnaire followed by a computer-assisted personal interview (CAPI). The questionnaire can be categorised into the following areas of interest:

- socio-demographics and occupation;
- lifestyle;
- early life exposures;
- psychological state;
- cognitive function;
- family history of illness; and
- medical history and general health.

Biological samples were also collected from each participant. Dr Peakman recognised that sample collection, processing, storage and retrieval has a major impact on sample quality and utility for future analyses, as such, UK Biobank has worked to gold standards to ensure high-quality clinically annotated biological specimens[2].

UK Biobank is now open for applications to use the resource and workshop delegates were encouraged to use the breakout sessions to think about the questions that could be uniquely answered in this resource. The access policies of UK Biobank were broadly endorsed by attendees.

Moving on to the potential for research, **Dr Cathie Sudlow, UK Biobank's Chief Scientist and Senior Epidemiologist,** highlighted the importance of the large numbers in this type of resource. Dr Sudlow explained the demographic characteristics of the cohort:

- 46% male;
- 57% aged 40-59; 43% aged 60-69;
- less socioeconomically deprived than UK average but all strata represented;
- 85% urban;
- 94.5% white; 5.5% other (reflects ethnic mix for UK);
- 58% paid employment / self-employed;
- 89% recruited in England; 7% in Scotland; 4% in Wales.

In the early phases of the resource (i.e. the first 10-15 years), extensive and powerful research will be able to be undertaken on incident cases of some of the more common conditions (including diabetes mellitus, coronary heart disease, COPD and breast cancer) as well as on some aspects related to conditions already present at recruitment.

After fifteen years (i.e. after 2020), it is anticipated that at least 10 complex diseases will generate 10,000 and then 20,000 incident cases, and many other conditions will generate enough cases to ensure that UK Biobank provides a valuable platform for population-based research. Figure 1 details the expected cases for significant causes of morbidity within the study's sample frame.

Figure1: Expected new cases in UK Biobank

Condition	2012	2017	2022
Diabetes	10,000	25,000	40,000
Myocardial infarction /Chronic Heart Disease	7,000	17,000	28,000
COPD	3,000	8,000	14,000
Breast cancer	2,500	6,000	10,000
Stroke	2,000	5,000	9,000
Colorectal cancer	1,500	3,500	7,000
Prostate cancer	1,500	3,500	7,000
Lung cancer	1,000	2,000	4,000

In discussion, concerns were raised by attendees about the potential to conduct nested case control studies on rare or less common cancers. For example, once the cases of a particular cancer have been stratified by ethnicity the numbers could be very small.

Ending the morning session, **Dr Kerina Jones (Senior Research Fellow in Health Informatics, Health Information Research Unit)** introduced the Secure Anonymised Information Linkage (SAIL) system, an internationally recognised data linkage resource formed from a wide variety of routinely collected data from across Wales. SAIL has been developed at Swansea University and includes over 2 billion anonymised person-based health-related records from across Wales. As well as representing a valuable resource for e-health research, datasets within SAIL will be linked to UK Biobank, allowing information about UK Biobank participants utilising health services in Wales (4% of the cohort) to be provided to researchers using the resource. SAIL is continually expanding, both in types of dataset and in geographical coverage. While the range of health-related data available through SAIL in Wales is particularly rich, similar health record linkage efforts for UK Biobank are being conducted in Scotland (7% of the cohort) and England (89% of the cohort).

Session 2 Overview

Session 2 Chair, **Professor Sir Alex Markham**, challenged participants to be ambitious in their ideas for research using UK Biobank. More broadly, he emphasised the importance of linking together and building on existing initiatives, such as UK Biobank, SAIL and the NCIN, to maximise their value for researchers.

Dr Michael Chapman (Research Programme Manager, National Cancer Intelligence Network) described how cancer registries are ideally placed to facilitate a collaborative and coordinated approach to longitudinal research. Dr Chapman outlined the work that the NCIN has begun with UK Biobank to identify cancer cases in the cohort and provide information about these.

Data completeness in the UK Biobank data was very good with data available for 99.79% and 99.99% of postcodes and NHS numbers respectively. Of the English resident subsample of UK Biobank matched to the National Cancer Data Repository (NCDR), around 41,900 patients were identified in the NCDR when matching on NHS number only. Matching rates based on the agreement of matching 3 factors, (NHS

number, sex and date of birth), fell to around 41,400 patients suggesting some data divergence.

Around 47,400 tumours were identified when matched on NHS number alone. The distribution of cancer cases by year of diagnosis shows good concordance between those identified in the NCDR and those recorded at the assessment centre. Dr Chapman also presented a range of questions and issues for consideration by workshop participants in relation to the relative priorities the NCIN could place on different areas of work.

Dr Naomi Allen, (Senior Epidemiologist, UK Biobank) discussed proposed enhancements to UK Biobank, which will provide new measures of exposure/phenotype and improve existing baseline measures. Firstly, UK Biobank have planned to replicate measurements in sub-subsets of the cohort (approximately 20-25,000 participants) to control for regression dilution bias, which may result in the underestimation of the real associations of disease rates with the "usual" levels of such risk factors during some particular exposure period. Consent for re-contact studies was also sought from participants to allow for research-driven re-contact. An Access Sub-Committee of the UK Biobank Board will oversee the process of approval for re-contact.

Furthermore, UK Biobank is developing a protocol for a panel of assays to enable researchers to look at well-known prognostic and predictive biomarkers. This panel will provide baseline measurements on all 500,000 participants and is likely to include CRP, HbA1c, sex hormones, IGF-I and vitamin D at baseline. Dr Allen explained that the rationale for the choice in assays related to their relevance across a number of disease areas. It is expected that 30-40 low cost biomarkers will be included in the assay panel. Other enhancements underway or planned for a large sub-set of the cohort include using a tri-axial wrist-worn accelerometer to measure physical activity, a series of imaging measures, and web-based assessments for self-reported outcomes that are not easily attained via routine linkage.

2 Breakout Sessions

Through discussion by five multidisciplinary groups, opportunities for research and recommendations for future enhancements were identified. Time limitations precluded a full consensus approach and the outcomes reported below summarise key findings reported back to the plenary group.

All groups recognised the importance of avoiding duplication, building on existing observational studies and making best use of existing tissue and data resources.

2.1 Genetic predisposition to cancer

Increasingly, cancer is being recognised as a heterogeneous collection of diseases in which initiation and progression are promoted by the aberrant function of genes that regulate DNA repair, genome stability, cell proliferation, cell death, adhesion, angiogenesis, invasion and metastasis, and determine response to chemotherapeutic agents. Many major gene defects have been causally linked to the development of cancer to date, such as mutation in BRCA1 in breast or ovarian cancer). Access to human genetic material and the information derived from it will serve in understanding variations in germ line DNA sequences or products that predict effects on the health, or influence the health management, of an individual. This includes an emerging ability for researchers to use genetic information to match drugs to the biological drivers of tumours – fuelling their capacity to provide personalised medicines. As the capacity of genetic research is moving at an accelerated pace, the group noted that population-based genetic research will be feasible on a totally new scale using UK Biobank.

The emergence of powerful technologies that allow the analysis of the genome and epigenome with unprecedented resolution in both high throughput and genome-wide settings has dramatically accelerated cancer research and molecular epidemiology. Attention needs to be given to continuing technology development, such as higher-throughput DNA sequencing or genotyping, scaling up analysis of RNA, proteins or metabolites, and the use of other possible biomarkers. Examples of potential research uses of UK Biobank were cited, such as the investigation of pre-malignant clones in the circulation of patients diagnosed with a cancer six months or more after donation to UK Biobank (their date of accrual into the cohort). The ability to enrich the data available for research with the patient's cancer genome was also seen as useful in verifying diagnosis.

To make best use of the data that will be derived from sequencing, and to avoid later indecision, the group felt that criteria should be set for when to carry out whole genome analysis of the material in the collection, based on the number of cancer (and other non-cancer disease) cases in the cohort, and the cost and quality (fidelity) of the analysis.

2.2 Environmental Factors

Environmental epidemiology seeks to understand how physical, chemical, biological, as well as, social and economic factors affect human health. There was consensus amongst the group that exogenous exposures of this kind can influence cancer outcomes. Despite this, more evidence regarding how environmental factors and endogenous cues that trigger neoplastic changes is required. UK Biobank offers considerable opportunity to investigate environmental factors that may contribute to the aetiology of cancer having collected information on exposure, outcome and covariates for each individual. It is anticipated that the resource may help test associations between cancer and exogenous factors, such as occupational risks (e.g. cancer risk among night shift workers), the interactions between environmental agents and genetic factors in carcinogenesis, and the role of diet and other chemicals in preventing cancer. It was noted that this research could not only help identify the 'risk factors' for conditions, but also reveal the possible biological mechanisms by which disease develops – opening up the possibility of developing new therapeutics based on knowledge of disease processes.

The latency period in cancer was also discussed, such as in the case of the natural history of the asbestos-induced cancer mesothelioma, which typically has a long latency period after exposure to the carcinogen. During the latent period between initial exposure and the onset of clinically detectable disease, pathological processes may be progressing slowly and inexorably, and they may be detectable with suitable screening tests. Although UK Biobank is a prospective study, it was felt it would be appropriate to look retrospectively at environmental exposures, most of which are unlikely to be recorded in the baseline assessment or subsequent linked datasets. The group were keen to explore information about environmental contaminants, before and after exposure to the cohort, e.g. the monitoring of indoor or outdoor air quality, measuring drinking water contamination and assessing waste disposal measures.

A geostatistical approach to incorporate individual-level data (e.g. participant residences) and area-based data for the estimation of the spatial distribution of disease was also considered. The group noted that geo-locality of participants by postcode or by a proxy measure to a particular stationary point would prove invaluable in environmental and spatial epidemiology. Geographical location is an important explanatory variable because it reflects an environmentally determined element of risk. It would be useful in understanding geographic variation of specific cancers including the clustering of areas with high or low incidence and/or mortality rates. Poor spatial resolution, the potential for spatial confounding, and the inability to consider latency patterns of disease should also be considered further. The ethics of tracking a participant's geolocality (real-world geographic location of an object/person) and making this accessible in a useful way to researchers would need to be further explored. It was agreed that there should be a call for a specialised environmental epidemiology enhancement group to consider this.

It was further agreed that linking to existing cohort data relevant to the Biobank participants, may also enhance information available on environmental exposure. It was suggested that linking to the 1958 British Birth Cohort study may provide additional retrospective information on the physical and educational development, economic circumstances, employment, family life, health behaviour, wellbeing, social participation and attitudes of a small number of UK Biobank participants. Members of this cohort (n=~17,000) were born in England, Scotland and Wales in one particular week of March 1958. In 2002, over 9,000 cohort members, aged 44–45 years, were measured for a range of biomedical parameters, such as blood pressure and lung function[3]. 97% of those that agreed to take part in this re-contact gave consent to extraction and storage of DNA for medical research purposes. The next survey of this cohort is planned for 2013, when the cohort members turn 55 years old.

2.3 Lifestyle and behaviour factors

We have strong evidence that an individual's risk of developing cancer can be substantially reduced by positive changes to modifiable behaviours, such as diet or physical activity. These factors are also amenable to change through behavioural, policy and environmental interventions. UK Biobank baseline data and associated enhancements offer considerable value for assessing lifestyle and behaviours prior to the development of disease; recognising that late-onset diseases are often influenced by earlier life events; for example understanding an individual's dental history would be valuable for research into oral cancers. Changes in endogenous stimuli were also considered, for example the onset of the menopause. The group further discussed the potential of UK Biobank for the long term study of survivorship by making use of information about previous diagnoses of cancer.

The group considered the value of repeating the baseline assessment to reveal changes to lifestyle and behavioural factors over time. Although UK Biobank does not have the intention to repeat the whole baseline assessment on the entire cohort at any stage, there is the possibility of researcher-driven re-contact with subsamples of the cohort if required and justified for a specific research project (subject to scientific justification, funding and appropriate ethical approvals). UK Biobank will enable the whole cohort to be followed with more practical, less expensive methods – such as linkage to health records and a series of web/postal questionnaire. It was noted that the very process of re-contacting has the capability to reaffirm the initial consent but that this will also remind participants of their right of withdrawal.

2.4 Pre-malignant conditions

UK Biobank presents considerable opportunities for the study of premalignant conditions both as diseases in their own right and as possible precursors of cancer. The group recognised that definitions of pre-malignant conditions are likely to change over time and as it stands, coding in the routine datasets available to UK Biobank is not of a consistently high standard. The recording of Monoclonal Gammopathy of Unknown Significance (MGUS) as a precursor to plasma cell dyscrasias and symptomatic multiple myeloma (MM), lung lesions as precursors to adenocarcinoma, and Barrett's oesophagus were named as examples of this.

For certain conditions, such as colorectal metastatic polyps, hospital admissions data could be used to identify the condition through procedure data. Hospital Episode Statistics (HES) will also be required to identify suitable controls for nested case-control studies of pre-malignant condition risk, since controls should also have had an opportunity to have their condition diagnosed (for example have undergone a colonoscopy) in order to minimise screening bias.

The group raised the possibility of understanding biomarkers of pre-malignant disease, for example using sequencing technology to understand RNA expression changes in cells. The lack of high-quality clinically annotated tissue specimens in UK Biobank was seen as a major bottleneck in understanding pre-malignant conditions and a barrier to the development of new treatments.

Viral infections that can lead to cancer were also mentioned, such as Human Papillomavirus and Hepatitis. It was suggested that there could be a link between NHS Blood and Transplant (NHSBT) and UK Biobank participants so that the screening data from blood donations could be shared. It was also agreed that identifying what additional vaccinations, such as holiday vaccinations, could be useful. Finally, the group discussed the potential to extend UK Biobank to explore both the microbial communities living in and on the human body and potential links to malignant disease.

2.5 Diagnostic and prognostic markers

To enable differential diagnosis and prognosis of cancers, reliable markers with sufficient sensitivity and specificity are needed to complement those that are already in clinical use, such as prostate-specific antigen (PSA), carcinoembryonic antigen (CEA), and alpha fetoprotein, (AFP). The group felt that the size and prospective nature of the UK Biobank cohort will make it more valuable for the validation of markers (e.g. validation as an immunodiagnostic test or for therapeutic responsiveness) than for playing a in role discovery science. This will be of particular importance in understanding whether or not proposed markers have real biological (causal) significance or are simply associated to a specific cancer.

The group agreed that for some types of prognostic biomarker research a disease-specific cohort may be needed; although it may be possible that UK Biobank could be used as a discovery set for rare cancers or rare subtypes. Concerns were raised over the restricted ethnic range of the database which may be prove challenging for some research; one example given was PSA antigen levels which differ between ethnic groups. There are a number of other large cohorts that would complement UK Biobank studies that require a wider mix with respect to ethnicity and other characteristics, these include the Million Women Study, the EPIC Study and the China Kadoorie Biobank Study (0.5 million people).

The group also explored using UK Biobank for multi-factorial association studies, for example in studies of low penetrance genes with odds ratios of 1.2 and 1.3, where thousands of patients are required for validation. Attendees also discussed the need for broader collaboration in diseases with few incident cases. Suggestions were made regarding amalgamating similar cohort studies to increase the research potential. The example of the existence of an International Consortium for Melanoma was provided and suggestions made that in less common cancers cases could be pooled through such consortia to produce a larger dataset with greater statistical power. In the case of this example, it was noted that UK Biobank will include information on participants

with a primary melanoma diagnosis, early relapse and later relapse making it an incredibly rich resource.

2.6 Access to tissue

One broad theme to emerge from the group discussions was the capacity for baseline data and associated annotated samples to be linked with tumour tissue held in diagnostic archives or research biobanks for the study of pre-malignancy and disease progression in incident cases of cancer. There was a consensus that access to tissue specimens would be extremely valuable in on-going work to link endogenous and exogenous factors with the mutational spectrum of tumours to enable increased diagnostic specificity and to allow for the study of biomarkers.

From this discussion, attendees agreed that if feasible, UK Biobank should secure access to high quality, fixed or frozen samples of tumour tissue for participants diagnosed with cancer. However, it was noted that both gaining access to these samples and assuring their quality is likely to prove challenging. It is anticipated that a significant proportion of cancer cases within the UK Biobank cohort will be reviewed in relatively few, larger centres for management by multidisciplinary teams. This should assist finding and retrieving tissue blocks. The NCIN is currently working to identify treatment centres for UK Biobank participants where samples are likely to form part of their diagnostic archive.

Concerns were raised by attendees over the retention of tissue by the NHS. It was noted that NHS providers do not to retain tissue blocks beyond current time guidelines, so some samples relevant to the UK Biobank cohort may be lost unless specifically identified and flagged for retention. It will be essential for UK Biobank to build relationships with the major NHS providers to secure these samples and, if possible, UK Biobank should take on a role of custodianship. Where the samples themselves cannot be retrieved alternatives such as digital imaging should be considered.

Sample collection, processing, storage and retrieval will have a major impact on sample quality and utility for future analyses. Various harmonisation activities are in progress to standardise these protocols but these are largely focused on the collection of samples for research biobanks, where patients have specifically consented from tissue to be collected for this purpose. UK Biobank could play an important role in supporting and promoting initiatives to develop and implement harmonised protocols for collecting tissue samples and ensuring that the relevant data to allow sample quality to be assessed are recorded. Furthermore, work will be required to clarify if the participants are appropriately informed that diagnostic samples form part of their health record. To ensure samples are held and made available for research, it was recommended that UK Biobank should establish links with research collections which may hold samples from participants and seek advice regarding consent.

3.0 Concluding remarks

In follow up to this report, the National Cancer Intelligence Network will publish initial analytical work, phenotyping incident and prevalent cancers cases in the UK Biobank cohort. It is expected this report will be available in mid 2013.

References

1. Allen N, Sudlow C, Downey P, Peakman TC, Danesh J, Elliott P, Gallacher J, Green J, Matthews P, Pell J. (2012) UK Biobank: Current status and what it means for epidemiology, *Health Policy and Technology,* 1(3):123-126

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4. Chen Z, Chen J, Collins R, Guo Y, Peto R, Wu F, Li L on behalf of the China Kadoorie Biobank (CKB) collaborative group (2011) China Kadoorie Biobank of 0.5 million people: survey methods, baseline characteristics and long-term follow-up, *International Journal of Epidemiology* 40(6): 1652-1666

Cancer Outcomes in UK Biobank Workshop
6th July 2012
6th Floor Lecture Area, Wellcome Trust
215 Euston Road, London NW1 2BE

Programme:

10.00-10.25	*Registration (Tea and Coffee to be served)*	
10.30-10.40	Welcome from the Chair	Maggie Wilcox
10.40-11.00	Introduction to UK Biobank and access arrangements	Dr. Tim Peakman
11.00-11.20	Research opportunities in UK Biobank	Dr. Cathie Sudlow
11.20-11.40	Exploiting routine data for longitudinal follow up	Dr. Kerina Jones
11.40-12.00	Questions and Discussion	
12.00-13.00	*Buffet lunch*	
Session 2		Prof Sir Alex Markham
13.00-13.30	Cancer in UK Biobank – what do we know?	Dr. Michael Chapman
13.30-14.30	Themed Breakout Sessions	
	1) Genetic predisposition to cancer	
	2) Environmental factors	
	3) Lifestyle and behaviour factors	
	4) Premalignant conditions	
	5) Diagnostic and prognostic markers	
14.30-15.00	Feedback from Breakout Sessions	
15.00-15.20	Planned enhancements to UK Biobank	Dr. Naomi Allen
15.20-15.30	Questions and Discussion	
15.30-16.00	Chair's summary and next steps	Prof Sir Alex Markham
16.00	CLOSE	

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About the National Cancer Intelligence Network

The NCIN is a UK-wide initiative, working to drive improvements in standards of cancer care and clinical outcomes by improving and using the information collected about cancer patients for analysis, publication and research.

Our aims and objectives cover five core areas to improve the quality and availability of cancer data from its collection to use:

- *Promoting efficient and effective data collection throughout the cancer journey*
- *Providing a common national repository for cancer datasets*
- *Producing expert analyses, to monitor patterns of cancer care*
- *Exploiting information to drive improvements in cancer care and clinical outcomes*
- *Enabling use of cancer information to support audit and research programmes*

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Using information to improve quality & choice