NHS
National Institute for Health Research

BIOMEDICAL RESEARCH UNIT ANNUAL REPORT

2016/17 Financial Year

Note: The accompanying *NIHR Biomedical Research Units – Guidance on Completion of Annual Reports for 2016/17 Financial Year* contains essential guidance on the information you need to provide when completing this proforma. **Please complete the form using a font size no smaller than 10 point (Arial) and submit it as a Word Document.**

1. UNIT DETAILS

Name of the NIHR Biomedical Research Unit:

The NIHR Biomedical Research Unit in Nutrition, Diet and Lifestyle at the University Hospitals Bristol NHS Foundation Trust and the University of Bristol

Contact details of the individual to whom any queries on this Annual Report will be referred, and to whom feedback on the annual report will be sent:

Name: Dr Vanessa Marshall

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2. DECLARATIONS AND SIGNATURES

Contact details of the NHS Organisation administering the NIHR Biomedical Research Unit award:

Name: University Hospitals Bristol NHS Foundation Trust

Address: Trust Headquarters, Marlborough Street, Bristol BS1 3NU

Name of the Chief Executive of the NHS organisation:

Mr Robert Woolley

I hereby confirm, as Chief Executive of the NHS organisation administering the NIHR Biomedical Research Unit award, that this Annual Report and the Financial Report have been completed in accordance with the guidance issued by the Department of Health and provides an accurate representation of the activities of the NIHR Biomedical Research Unit:

Signature …….. **Date:** ……

(Chief Executive)

3. OVERVIEW OF ACTIVITIES (no more than two pages)

Please provide an overview of activities for your NIHR BRU for the 2016/17 financial year, addressing the following areas:

- **progress against short, medium and long term objectives as detailed in your approved full application;**
- **progress with leadership, governance and management arrangements for your NIHR BRU;**
- **any changes to the approved strategy for the BRU in translating findings from basic research into excellent patient-focused research and benefits for patients;**
- **any significant developments in implementing the strategy; and**
- **a list of the BRUs top three achievements during the 2016/17 financial year.**

Progress against objectives

Over the last five years we have made significant progress with our short medium and long term objectives which we have outlined in the sections below. We now have over 100 approved projects across all our five research themes, and have recruited over 2000 participants to these studies. The details of these are listed in the Finance and Activity Reports and on our website.

Leadership, governance and management arrangements

The management structure and reporting framework for the Bristol Nutrition BRU have continued over the last year. Our executive group comprises the director (Professor Andy Ness), the deputy director (Professor Julian Hamilton-Shield), two other theme leads (Professor Richard Martin and Professor Ashley Cooper), and the unit manager (Dr Vanessa Marshall). The Executive Group has previously agreed terms of reference and meets every two weeks. We successfully introduced the role of deputy theme lead. The deputy theme leads are: Dr Charlotte Atkinson (Peri-operative theme), Professor Angie Page (Sedentary/Diabetes theme) and Dr Athene Lane (Prostate cancer theme). They have attended larger quarterly meetings of the executive. Research themes and cross cutting activities (including PPI, engagement, training, statistics, systematic reviewing, qualitative methods) provide formal reports to the unit's executive group. These are then collated into a quarterly update report that is tabled at meetings of the NHS trust's research group and at equivalent research groups in the two university faculties within which the unit operates.

Strategic developments

Our strategy group comprises three external senior academics (Professor Janet Cade, University of Leeds: Professor Kay-Tee Khaw, University of Cambridge: Professor Ivan Perry, University of Cork) and two patient representatives drawn from our BRU patient and public involvement groups in colorectal surgery and prostate cancer, (Rik Lander and David Casley). They last met on the 20th May 2016. Professor Janet Cade and Mr Rik Lander attended and spoke at our scientific meeting on 21st October 2016. As previously reported they were positive about our achievements and extension of our themes

BRUs top three achievements during the 2015/16 financial year

1. *Completion of BRU projects and transition to a theme in a Biomedical Research Centre*

Over the last year we bid for a nutrition theme in the NIHR Bristol Biomedical Research Centre. The nutrition theme was awarded in full. This award represents a natural continuation and progression of our work to extend our research themes (reported last year as one of our three achievements that was commended by our strategy group). We included staff in the planning process. We briefed them at each stage and we openly acknowledged uncertainty about funding. We also ran additional staff training and team building events over the last year. As a result we ensured that staff morale was maintained, few staff applied for other jobs and staff remained focussed and productive. With a full complement of motivated staff we have been able to map

out and follow detailed work plans that have ensured that BRU projects are completed and closed down or continued and extended as part of the programme of work funded in the BRC. As we continued to open project in the final years of the BRU and because analysis and write up of projects takes time we will continue to disseminate our findings over the first two years of the BRC but most of the work on these projects is completed so there will be no discernible impact on activity in the BRC nutrition theme.

2. *Continued commitment to training, PPI and engagement*

We have maintained our commitment to training, PPI and engagement in the final year of the BRU. We describe these in detail in the sections below.

3. *Continued research output and dissemination*

We continue to produce important findings that are being written up for publication. We have now published 80 papers with more manuscripts in preparation. We have also presented our work at national and international conferences and we have presentations accepted. We also disseminate our findings through our comprehensive programme of engagement activities. We describe these in detail in the sections on each of our research themes.

4. PROGRESS MADE IN EACH RESEARCH AREA (no more than one page per research area)

Childhood Disorders Theme

This was the last year as a BRU and thus much of the final year work concentrated on finishing off various projects, writing up papers and preparing for our bid as part of the proposed (successful) Bristol Biomedical Research Centre. The children's workstream strategy within a larger BRC remains the study of lifestyle and nutritional interventions to improve the health or children with chronic disease.

Areas for exploration within the childhood theme:

- Define and refine eating behaviours in children with obesity, examining the role of genetic contributions to eating speed/behaviours. We will use functional MRI studies and hormonal measures to understand the impact of meal pattern alteration/ topography of eating.
- Develop nutritional and physical activity interventions in children with cystic fibrosis-related diabetes (CFRD) to improve glycaemic control (Now an NIHR PhD Project).
- Develop interventions to reduce barriers to physical activity and extend the role of physical activity in the management of type 1 diabetes through teacher education in schools and sporting facilities.
- Develop and test a simple behaviour change intervention suitable for primary care and asthma clinics to help parents identify the difference between asthma and exercise breathlessness and promote physical activity in children with asthma

New opportunities/avenues:

- An entirely new area is the study of activity change/exercise interventions to improve lipid profiles above that attained by statins alone in families with familial hypercholesterolaemia using metabolomics (Collaboration with NIHR Leicester/Loughborough).
- EAT-ON study (Collaboration with KCL): Follow up of the Randomized Trial of Introduction of Allergenic Foods in Breast-Fed Infants (EAT study. Lack G, KCL. N Engl J Med 2016;374:1733-43.). What effects does the early introduction of protein solids at 3 months have on growth, obesity and metabolic status (IGF-1 axis) in children aged seven years

Continuing collaborations from last report:

- We have developed a close collaboration with the Nutrition Behaviour Unit (NBU) in Experimental Psychology allowing us to study parental opinions regarding optimal meal sizes for children at risk of obesity and how 'memory of meals' influences later eating habits. We have now had first publication from this collaboration: Parental beliefs about portion size, not children's own beliefs, predict child BMI. Pediatr Obes. 2017 Apr 4. doi: 10.1111/ijpo.12218. [Epub ahead of print]. PMID: 28374550.
- We have developed close links with staff in the MRC IEU allowing us to begin to understand the influence of obesity variant genotypes on eating behaviour and will develop further studies in this area within the new BRC.

Progress with leadership of the research area, including any changes or challenges faced;
The theme continues to be led by Professor Julian Hamilton-Shield

Major grant awards received as a consequence of NIHR BRU funding;

- Ms Laura Birch has been successful in obtaining an NIHR Integrated Clinical Academic Programme – Clinical Doctoral Research Fellowship (C-DRF) to study the use of a low glycaemic index diet in Cystic Fibrosis related diabetes in children and young adults following on from her Clinical Academic Training Programme Internship Award. This work will conducted within our BRC theme from June 2017 onwards.
- Dr Ela Hinton has led a successful collaborative bid (with Exeter University, Natalia Lawrence) for a GW4 PhD (MRC funded) 'Towards personalised behavioural obesity treatment in children and adolescents' with the student starting in September 2017. This proposal is based on successful work undertaken in the BRU on hormonal changes, eating topography and fMRI imaging whilst changing eating behaviours undertaken by Dr Hinton and and Dr Kate Hawton on an Elizabeth Blackwell (Wellcome) Clinical Primer.

Examples of the creation and development of intellectual assets (i.e. patents, etc.) through the work of the research area. N/A

Prostate Cancer Theme

- We have now completed recruitment, follow-up and data collection for the PrEvENT (Prostate Cancer: Evidence of Exercise and Nutrition Trial) factorial RCT. 108 men were recruited into the baseline cohort with 81 randomised within the nested trial. Analysis is ongoing and we are drafting five publications. The trial demonstrated good retention of participants, with only three withdrawals. Qualitative interviews conducted upon trial completion concluded that the trial interventions were acceptable and well tolerated (Hackshaw-McGeagh, Shingler et al., *Trials*, 2017).
- We undertook a discrete choice experiment (a technique for eliciting preference in a hypothetical setting) in men with prostate cancer (HEAL-PC: 'Eliciting people's preferences for Healthy Eating and Active Lifestyle Intervention after Treatment for Prostate Cancer using Discrete Choice Experiments'). Analysis is currently underway in collaboration with University of Manchester.
- We are developing a new feasibility RCT, which aims to compare exercise or metformin versus a control arm in men with prostate cancer undergoing radical prostatectomy or radiotherapy.
- We identified that within a six-month lycopene and green tea dietary intervention trial (ProDiet), the lycopene dietary intervention modified circulating levels of pyruvate, alanine and valine. We found no strong evidence that green tea altered the metabolome.
- We are exploring NMR measured metabolites in 2500 PSA-detected cases and 25000 controls. In our comparison of blood collected at diagnosis, 36 of 228 NMR-measured metabolites in PSA-screen positive cases (2335) and controls (2705) in ProtecT were observed to have p-values less than our principal components-derived multiple-testing threshold ($p<0.0014$) in a logistic regression of the effect of metabolites on prostate cancer. We are currently using Mendelian randomization to explore whether these effects are causal.
- Multiple other Mendelian randomization studies have been completed including exploring the possible causal role of coffee consumption with prostate cancer risk and progression, the association between telomere length and risk of cancer and analysing blood lipids and prostate cancer.

Progress with leadership of the research area, including any changes or challenges faced:

Continues to be led by Prof Martin and Dr Lane, School of Social and Community Medicine.

Details of the progress of the research area's strategy:

We are building new areas of work, to: i) assess the feasibility of tertiary prevention (e.g. smoking cessation using e-cigarettes) in head and neck cancer; and ii) incorporate repurposed drugs as low-toxicity interventions targeting metabolic dysfunction in people with cancer (e.g. metformin in the prevention of prostate cancer progression). We are developing an international collaboration with the Victoria Cancer Council, Melbourne. R Martin is co-investigator on an application to the Australian government to co-design and pilot-test an intervention to reduce sedentary time, to be developed and evaluated collaboratively in Melbourne and in Bristol. A linked grant is submitted to the Victorian Medical Research Acceleration Fund (Australia) with L Hackshaw-McGeagh and R Martin as co-applicants.

Major grant awards received as a consequence of NIHR BRU funding;

- Vincent E, Timpson N, Martin RM et al. 'The influence of cancer of people living with diabetes'. RD Lawrence Fellowship, Diabetes UK. £587,237.11
- Dudding T, Martin RM (sponsor). 'Vitamin D and head and neck cancer risk and progression: An examination of causality and mechanisms' Wellcome Trust Intermediate Clinical Research Training Fellowship (ref: 201237/Z/16/Z). £187,327.
- Davey Smith G, Relton C, Timpson N, Martin RM et al. Wellcome Trust PhD in Molecular, Genetic and Lifecourse Epidemiology. (ref: WT108902/Z/15/Z). £1.35 million Deputy-Director.
- Haycock P. Supervisor: Davey Smith G, Collaborators: Martin RM, et al. 'Appraising the causal relevance of fatty acids in cancer through two-sample Mendelian randomisation'. Cancer Research UK Population Research Committee – Postdoctoral Fellowship. £144,233.93

Examples of effective translation, or significant progress along the translational research pathway:

Analysis of the PrEvENT trial is currently underway, with the first papers to be published mid-2017. Once analysed and published, we will apply for funding to translate the feasibility trial into a full RCT.
Examples of the creation and development of intellectual assets:
We have developed the following freely accessible, online tools for: i) automated text mining of the literature for mechanisms underpinning associations between exposures and cancer (MELODI, http://melodi.biocompute.org.uk/); and i) for the curation and harmonization of large-scale genetic data and automated analysis of the data using Mendelian randomization (MR-Base, http://www.mrbase.org/).

Perioperative Theme

Progress against specific objectives detailed in the original application.

- Cochrane reviews: 1) gum chewing (sham feeding) after abdominal surgery has been published; 2) early post-operative feeding after colorectal surgery has been submitted to Cochrane; 3) immunonutrition in people undergoing surgery for head and neck cancer and postoperative recovery is nearing completion (updated search was completed in Jan 2017).
- Qualitative interview studies: one study explored experiences of perioperative nutrition in people undergoing colorectal surgery, and one explored the experiences, practices and contexts of healthcare providers towards the enhanced recovery after surgery programme. Two conference presentations and three manuscripts (one published, one accepted pending minor edits, and one under consideration) resulted from these studies.
- Pre-operative fluids: we are collaborating with clinical colleagues to develop a feasibility study to use ultrasound to look at gastric emptying as a proxy measure for risk of aspiration, with a view to ultimately minimising the time that patients are kept nil by mouth prior to surgery.
- Discrete choice experiment: we recently published a study which showed that for survivors of colorectal cancer there is not one approach that suits all when providing dietary advice.
- Parenteral nutrition: our studies into the role of parenteral nutrition in managing inoperable bowel obstruction in women with ovarian cancer are ongoing.
- We have continued to foster links with colleagues in clinical oncology and stoma care in the development of studies of diet-drug (chemotherapy) interactions and diet in stoma patients (a group identified as particularly vulnerable in the qualitative studies).

Progress with leadership of the theme

The research area continues to be led by Dr Charlotte Atkinson (deputy theme lead), under the guidance of Professor Andy Ness.

Details of the progress of the theme's strategy

- We have added value to an NIHR RfPB funded trial of chewing gum after colorectal surgery (main findings published in the British Journal of Surgery) by using the data for: 1) describing determinants of post-surgery dietary intake and associations with outcomes (a chapter in an NIHR trainee's PhD thesis); 2) determining relationships between sarcopenia and surgical complications; 3) exploring patient and/or operative factors in relation to outcomes of surgery; 4) a subgroup analysis presented at the 2016 ESPEN Congress; and 5) a per protocol analysis using an instrumental variable approach.
- Following advice from our Clinical Trials and Evaluation Unit (CTEU) on a proposed RCT of perioperative immunonutrition in people having head and neck cancer surgery, we are exploring ways to conduct feasibility work to assess factors such as compliance.
- Our collaboration with colleagues at the CTEU and the NIHR Cardiac BRU in Bristol on prehabilitation studies is ongoing: 1) the systematic review protocol paper has been published, and data extraction for the main paper is almost complete (>130 papers have been extracted to date); 2) a draft manuscript from the survey of preoperative services has been circulated for comment; 3) work on a cohort study to describe a contemporary cancer surgery population and comorbidities is ongoing.
- Work to date on the development of a long-term food-based dietary intervention in frail elderly waiting for joint replacement includes gaining the views of a PPI group and gathering feedback on palatability, logistics, etc. of frozen meals delivered to the home. Scoping work on current wait times prior to surgery and characteristics of patient populations has begun.
- The following areas of work were identified as priorities for the peri-treatment workstream of the Nutrition theme of the NIHR Bristol BRC: diet in people with a stoma (as a direct result of findings from the BRU qualitative studies); low iodine diet and radio-iodine ablation; sarcopenia and chemotherapy dose; fasting and chemotherapy dose/side effects.

Examples of effective translation, or significant progress along the translational pathway, as a result of NIHR BRU funding.

The identification of people with a stoma as a particularly vulnerable population (especially regarding diet) in our qualitative studies led to the inclusion of this as a work package in the peri-treatment workstream of the Bristol BRC (Nutrition theme). Other areas of need have been identified, and by addressing these gaps in knowledge and providing sufficient supporting information, we will be able to apply for funding to definitively evaluate interventions in clinical trials.

Examples of the creation and development of intellectual assets (ie patents, etc) through the work of the research theme. N/A

Sedentary/Type 2 Diabetes Theme

Sedentary/Type 2 Diabetes Theme

Systematic reviews

- An extensive systematic review into eating architecture, obesity, type 2 diabetes (T2D) and cardiovascular disease is ongoing
- A systematic review and meta-analysis of the effectiveness of green tea/ green tea extract on insulin resistance and glycaemic control in patients with T2D is in review (Yu J. et al. Nutrients). No effect was identified.

Efficacy of modifying sedentary time on change in metabolic outcomes.

- Analysis of a small (n=18) randomised crossover trial to investigate the effect of interrupting sedentary time by standing and walking on blood glucose has been completed and is now in press (Brocklebank L. et al. Journal of Physical Activity and Health doi: 10.1123/jpah.2016-0366). This study is currently being extended to free living people with T2D.
- We investigated the patterns of active commuting (AC) in 6,896 adults with T2D in the UK Biobank cohort and who reported commuting behaviour. AC may offer a potentially sustainable behavioural solution to increasing physical activity and reducing sedentary behaviour. A manuscript is currently in review (Falconer C. et al. BMJ Open).

Qualitative investigation of sedentary behaviour.

- We have conducted an in depth analysis of transcripts from the Early ACTID RCT to explore motivation for physical activity behaviour change in that study. A manuscript is in review (Sebire S. et al. International Journal of Behavioural Nutrition and Physical Activity).
- In-depth semi-structured interviews have been conducted with participants in the PEDAL study (see below) to investigate their experience of the study and their engagement in e-cycling before and after the intervention.
- We have conducted 111 surveys and 15 drive along interviews (45 minutes) in an ethnically diverse (mainly male) sample of taxi drivers who reported being relatively inactive and of an unhealthy weight. Analysis is ongoing.

Novel methodology for measuring time outdoors

- We measured time spent and physical activity outdoors in 88 people with T2D by integrating accelerometer and global positioning system (GPS) data, using hidden Markov models to identify outdoor walked journeys from the accelerometer/GPS data.

Evaluation of instrumentation to measure sedentary behaviour

- We found that a waist-worn Actigraph accelerometer overestimated sedentary time by 1.9 hours/day compared with objectively measured sitting time (ActivPAL), but underestimated total sitting plus standing time by 2.1 hours/day. Associations between sedentary time measured by either method and metabolic outcomes were essentially the same however.

Feasibility of intervention to target sedentary time.

- We conducted a feasibility study to explore the use of electric bikes (e-bikes) in people with T2D. 19 people with T2D were trained by a third sector partner (Life Cycle) before being given an e-bike for personal use for 5 months. The data suggest that such an intervention is acceptable and may be feasible to improve health: a pilot RCT is in development.

Progress with leadership of the theme
No changes in the past year.

Examples of effective translation, or significant progress along the translational pathway, as a result of NIHR BRU funding. We have explored a translational route by which cycling may be used to improve the health of people with T2D with colleagues in Sustrans Newcastle, part funded by the Stockton CCG. Participants with T2D were referred to Sustrans for 6 weeks of active travel facilitation, using self monitoring of physical activity to support behaviour change. Unfortunately numbers accepting referral were low. Engagement with the facilitation was inconsistent but generally poor.

Examples of the creation and development of intellectual assets through the work of the research theme. We have developed a brief dietary assessment tool, the UK Diabetes and Diet Questionnaire (UKDDQ) (England C. et al. Public Health Nutrition 2016; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5244439/). (See Added Value Example).

Core Theme

Progress against specific objectives detailed in the original application

Objective 1 - Training in nutritional research methods for clinicians and non-clinical scientists to strengthen research in nutrition in clinical populations- See training section.

Objective 2: *Identify further interventions for clinical populations translated from observational studies and transferred from trials in primary care and the general population:* Our core theme has carried out experimental research projects not included in any of the specific themes to help identify further interventions for clinical populations. Over the last five years we approved 13 projects and summarise progress with these projects below:

- **Can Quantab titrator sticks reliably predict urinary sodium in people with suspected dehydration.** This study won an Innovations Challenge Award. A paper describing the comparison of dipsticks and laboratory tests is in revision with *Clinical Nutrition ESPEN*.
- **Omega 3 fatty acids and depression in adults (a systematic review).** This review was published as a Cochrane review and as an abridged review in *BMJ Open.*
- **Systematic review of animal and human studies of artificial sweeteners on appetite and obesity.** This review was published in the *International Journal of Obesity.*
- **An ethnographic study of food choices in public areas of a sample of UK NHS hospitals.** This medical student project was successfully completed. It provided the impetus for a further project that is now being written up for publication.
- **Taking folate in pregnancy and all cause and cause specific mortality –** further follow up of the Aberdeen folate trial. The results of this study were published in the *Journal of Epidemiology and Community Health*.
- **Evaluation of urinary chloride dipsticks for the rapid estimation of hydration status in patients receiving artificial nutrition.** This project represents an extension of feasibility work on the Quantab stick. We are finalising a study protocol that we will submit for ethical approval in next month. An ACF will take this project forward to provide her with preliminary for her research fellowship application.
- **Diavit and VEGF splicing in diabetic neuropathy.** We were in the process of designing feasibility study to assess acceptability and impact on intermediate biomarkers of a dietary supplement in diabetics with renal failure when the lead investigator accepted a job elsewhere.
- **Developing a framework for efficiently document BRU research data**. The project is completed and the novel software package is being finalised for submission to the Comprehensive R Archive Network (CRAN) and a journal article is in preparation.
- **Pulsed glucocorticoid replacement therapy for patients with adrenocortical insufficiency secondary to Addison's disease and congenital adrenal hyperplasia (Pulses Study).** We have recruited 16 people so far with target of 20. The study will close at the end of 2017.
- **Pilot Study using Wellpoint healthcheck Kiosk in BRI for health professionals.** We completed this NOCRI initiated collaboration with industry in conjunction with Leicester/Loughborough BRU. We presented a poster and we are preparing a short report for submission.
- **The association between adiposity and the presentation and clinical course of Crohn's disease.** This is an MD project. The fellow took on additional caring responsibilities and recently accepted a consultant job so progress has been delayed.
- **Effects of nicotine challenge on eating topography** – we are working with the MRC Integrative Epidemiology Unit and the Nutrition Behaviour Unit – we plan to start fieldwork in the autumn.
- **Aberdeen folic acid supplementation trial: Follow up of offspring** – We have completed this project and a paper has been submitted to PLOS *Medicine*.

Objective 3: *Multidisciplinary research capacity for each of the areas*: Our core team provides co-ordinated methodological support across all themes. Our core team offers mentorship and practical support in data management, systematic reviewing, statistics and qualitative methodology. Our core team is also supporting patient and public involvement and public engagement. It continues to be effective and is described in the relevant sections below.

Progress with leadership of the theme: There have been no changes to leadership.

Details of the progress of research area strategy, including any changes (e.g., discontinuation of originally planned work, or new areas of research): We have continued our work as planned (see above).

Examples of effective translation, or significant progress along the translational pathway: We have completed several policy relevant reviews.

Examples of the creation and development of intellectual assets

Intellectual assets in the form of publications and conference presentations have resulted from work in this research area (see Publications section of Finance and Activity report).

5. PATIENT AND PUBLIC INVOLVEMENT, ENGAGEMENT AND PARTICIPATION (no more than one page)

Patient and public involvement:

Progress has been made in delivering our PPI objectives over the last year through our three PPI groups. This contribution has had a positive impact on the research projects themselves, and encouraged others in the BRU to plan a PPI element into new projects. The Prostate Cancer group have given feedback on materials for ProtecT, the largest RCT of prostate cancer screening in the world, as well as comprehensive involvement in the PrEvENT trial, including protocol development, PIS amendments, and improving recruitment. This group have provided feedback on several experimental studies, and one member became an author on a research paper in a peer-reviewed journal. The Perioperative health PPI group have provided support for several internal BRU studies in the study design, recruitment strategy and study materials. Additionally, feedback from this group was provided for several external studies, fostering collaborations with the Bristol Cardiac BRU. Our newest PPI group, Diabetes research action group (DRAG) have already commented on recruitment, design, revised the lay summary of the new 'PEDAL' study, and provided support for several fellowship applications. Members of our PPI groups attended the BRU Scientific day in September 2016, and one person gave a well-received presentation on participation in PPI in research. In March 2017, our PPI groups were invited to a meeting to summarise their considerable contribution over the course of BRU. This meeting provided an opportunity to ask the members to evaluate their experiences in the PPI groups. The responses thus far revealed unanimous agreement that their contribution is welcomed, the groups are well organised, and they receive appropriate feedback. All members found the experience personally rewarding and feel confident their involvement is likely to improve the Unit's research. This will be fed back to the governance structures of the BRU through the PPI member on the executive board. Patients and the public can learn about our studies through the website. Due to the nature of our research, we do not generally advertise our research for anyone to sign up. Once we are recruiting, we have research specific methods, such as screening theatre lists, consultant discussing with patients, research nurses and posters. For details of all the activities conducted in the last year, please see the following links: http://www.uhbristol.nhs.uk/research-innovation/our-research/bristol-nutrition-bru/patient-and-public-involvement/
http://www.uhbristol.nhs.uk/research-innovation/our-research/bristol-nutrition-bru/news/

Public Engagement:

Staff from all themes in the unit have continued to be active in delivering engagement activities and reporting back on outcomes in line with the Unit's Engagement policy. http://www.uhbristol.nhs.uk/research-innovation/our-research/bristol-nutrition-bru/engagement/ The Bristol Nutrition BRU completed a community-based feasibility study, entitled "Kitchen on Prescription", together with The Portland Centre for Integrative Medicine, All About Food, Bristol, Square Food Foundation, University of the West of England, University of Bristol, and University Hospitals Bristol NHS Foundation Trust. Dr Elanor Hinton and Nada Khahil ran 'the Healthy Eating Project' at a local science centre (@Bristol), in collaboration with colleagues at the University of Exeter. The aim was to help children and adults to make healthy food choices with their new app called FoodTrainer – over 140 people participated from age 2-63 years. The BRU had a stand at the International Clinical Trial Day at the Bristol Royal Infirmary, with the important theme "Impact of research". Dr Fiona Lithander gave a talk to the Galenicals Nutrition Society in December 2016. Media appearances included Julian Hamilton-Shield's contribution to BBC Panorama's "Diabetes: The Hidden Killer". He was filmed with his academic colleague, Professor Tim Barrett, about the UK Type 2 Diabetes epidemic. He was also interviewed on BBC Inside Out about the scale of the UK Diabetes crisis. Regular engagement with patients takes place during BRC studies; for example, in PrEvENT our cohort of men with localised prostate cancer, men are engaged when recruited to the research, and then have regular contact with the research team throughout. We have also conducted interviews with trial participants who have completed the research trial to help evaluate the research and explore participation in the research trial. Moreover, participants are informed of the findings from the studies in which they participated: participants from the GUM trial (a RFPB & BRU supported project) were sent letters following the trial by Dr Charlotte Atkinson, comprising a summary of the main results, the abstract from the main paper and a link to the manuscript hosted by the BRU website. Members of all themes have regular contact with both professional practitioners and academic peers in their fields: The Prostrate theme regularly meet to discuss their research development and outcomes with Urological Surgical Consultants, Research Nurses and Urology Clinical Nurse Specialists, who provide feedback on the ongoing research as well as helping to develop new research ideas. Many staff members from all themes presented findings from BRU studies at both national and international conferences in 2016-17. Furthermore, Julian Hamilton Shield chaired a Public Policy Exchange symposium in London on November 8th, titled "Improving Child Health and Wellbeing: Tackling Childhood Obesity at the National and Local Levels". Finally, monthly seminars took place at the BRU which were open to the public and advertised on the website. All previous seminars from 2013-2016 are listed along with the seminar series for 2017: http://www.uhbristol.nhs.uk/research-innovation/our-research/bristol-nutrition-bru/seminar-series/

6. TRAINING (no more than two pages)

Please describe any highlights from the education/training provided for your NIHR BRU staff over the last year.

Our aim is to ensure equitable opportunities to enable the development of all clinical and non-clinical staff and students. Over the past year we have continued to offer a wide range of training opportunities, as described in our training policy (see http://www.uhbristol.nhs.uk/research-innovation/our-research/bristol-nutrition-bru/training/). Activities and opportunities are grouped into five areas which are briefly described below, along with some highlights from the past year.

1. Students and placements

- *Studentships*: Four PhD students (three non-clinical and one clinical) have been, or are being, fully (n=3) or part (n=1) funded by the BRU. Two students have graduated (one in the last year), one recently submitted her thesis and is awaiting her viva, and one is in her final year (she has had two periods of maternity leave during her PhD). In the past year, the BRU hosted an MD student and an NIHR Research Methods Fellow (now in her second year), and two Academic Foundation Placement students from August to December 2016 (both of whom continue to work with us one day a week).

- *Internships*: These are aimed at post-graduates looking to obtain experience in the areas of scientific research administration or clinical trial management. Building on the success of our previous intern [who is now doing a PhD at the University of Bristol (UoB)] we recruited two interns for twelve month posts from September 2016. In addition, one of our Senior Research Associates (Dr Ella Hinton) had a six-month part-time secondment at Nutricia.

- *Dietetic research training*: The Dietetic liaison lead (Laura Birch) has continued to support research training and development for clinical dietetic colleagues in the UHBristol NHS Trust. Laura attends dietetic departmental meetings and liaises with dietetic colleagues via email to keep them informed of research events such as the BRU seminar series and other relevant training opportunities. Ongoing activities have included the delivery of research workshops and updates in addition to the provision of individualised advice and support to local Dietitians and other Allied Health Professionals setting up clinical research studies. One such study has been awarded NIHR funding as part of a Masters in Clinical Research and is being fully supported by the Research Dietitians in the Nutrition BRU.

2. NHS and University Training

- *Generic/core training*: Staff and students are encouraged to attend training offered by the Trust and UoB, e.g., 'Information Governance' and 'Recruiting and attracting doctoral students'.
- *Good Clinical Practice (*GCP) and other mandatory training: Staff and students have access to mandatory training such as GCP training courses and equality and diversity training.
- *Short Courses*: These courses are run by the School of Social and Community Medicine at the UoB, and cover a range of health services research and epidemiological methods, as well as generic research skills. In the past year, 10 places on these courses have been funded by the BRU.

3. NIHR Training

- *NIHR training opportunities:* Staff and students who are part or fully funded by the NIHR can take advantage of courses and meetings offered by the NIHR. One of our past PhD students attended the NIHR summer school residential course at Ashridge in July 2016, and a PhD student and Research Methods fellow attended the 10th Annual NIHR Trainee Meeting in Leeds in December 2016. Two members of staff also attended a CLAHRC West scientific writing course in October 2016. Staff and students are notified of (and encouraged to participate in) NIHR-led webinars, and information on other training opportunities is cascaded to members of the Unit by the Training Lead.
- *NIHR infrastructure:* Over the course of the BRU we have developed relationships with other parts of the NIHR infrastructure with an interest in nutrition and physical activity (Leicester/Loughborough and Southampton) which has resulted in the provision of reciprocal training opportunities, e.g., free places on the MEASURE course run by the Leicester/Loughborough BRU, the Intercollegiate Course in Nutrition run by the Southampton BRC, and our Nutrition Epidemiology course (see below).

4. BRU Internal Training and Staff Review

- *Reading Group*: The BRU has run several reading groups which all staff and students could attend. Examples included covering key basic methodological texts or specific articles / book chapters over several weeks to provide a platform for learning and discussion away from day to day tasks.
- *Present and Discuss*: These regular meetings provide an informal platform to talk about current or previous work, lessons learned from prior work, to practice a presentation, or to feedback on attendance at a conference. BRU staff, students, affiliates, and visiting fellows, in addition to other UoB and UHBristol staff and students, have attended and/or presented at these meetings.

- *Research Methods course*: Staff and students have access to online training on research methods, consisting of a series of e-lectures developed by Dr Sam Leary (Senior Lecturer in Statistics, and steering group member of the NIHR statistics group). Three associated 2-hour tutorials can be used in conjunction with the e-lectures to augment / reiterate information from the e-lectures.
- *Training Days*: Training workshops / seminars have been run with support and input from, for example, the Research Design Service Southwest, Research and Innovation, and UoB library service.
- *Team Building and Away Days*: From time to time the BRU runs team building events (e.g., working in teams to cook our Christmas dinner at a local charity, The Square Food Foundation) and away days to encourage cross-Unit interactions and allow a more strategic discussion of topics related to the Unit. In the past year, we held a series of away days to ensure the submission of a strong bid for the Nutrition theme of the NIHR Bristol BRC. Two 'Mindset Management Training' days for all staff and students were also held in the past year to provide training primarily in project management.
- *Travel and Conferences*: Staff and students are encouraged to attend relevant national and international scientific meetings, and individualised training budgets fund or part fund these meetings.
- *Staff Review*: All staff are encouraged to meet regularly with their line manager / key colleague, and to undergo formal staff review once a year (at which training needs are discussed).
- *Co peer review*: Senior staff are encouraged to co peer review manuscripts with junior staff.

5. BRU Open Training

- *Seminar Programme*: The BRU has a seminar coordinator, and speakers include both internal and external people. As well as broadening knowledge base, they provide an opportunity to develop collaborations. For example, Professor Gary Frost spoke at a BRU seminar, after which BRU researchers met with his group at the Department of Nutrition and Dietetics, Imperial College London, for a one day meeting in February 2017 to discuss projects and explore collaboration. Bristol will host a reciprocal event in June 2017.
- *Workshops*: We continue to run the 'Nutritional Epidemiology - An introduction to issues in analysis and interpretation of dietary data' course on an annual basis, and free places are offered to the Leicester and Southampton BRCs.

Summary

As shown above, our training covered a broad range of areas and, as such, aimed to develop staff in all clinical and non-clinical professions. We had a named training lead (Dr Charlotte Atkinson) along with a dedicated training budget, and we encouraged all staff and students to take advantage of the opportunities available to them.

- **Specific training plans for the BRU**

In the next year, and as part of the Nutrition theme of the NIHR Bristol BRC, we will continue to facilitate access for staff and students to a wide range of training opportunities both in house and elsewhere. In collaboration with the overarching BRC training lead, we will re-visit the Nutrition theme training policy and amend it as needed. Regarding trainees, in addition to PhD projects funded through the NIHR Bristol BRC, funding has also been secured from the MRC GW4 Biomedical Doctoral Training Programme for a PhD student to start within the Childhood workstream in September 2017, and Laura Birch (Senior Research Associate in the Childhood workstream) has been awarded an NIHR C-DRF to start in June 2017.

- **Ongoing or planned collaborative training, secondment or networking with other parts of the infrastructure.**

We will continue to share ideas with training leads at BRCs with an interest in nutrition and physical activity (e.g., Leicester, Southampton, and Imperial). A clinical PhD project within the Childhood workstream of the BRC Nutrition theme will be done in collaboration with colleagues at the Leicester BRC. As noted above, reciprocal training opportunities have, and will be, offered across the nutrition-related parts of the NIHR infrastructure, including the provision of free places on training courses that are usually run on a fee-per-person basis. In addition, we will further explore potential areas of collaboration with researchers at Imperial and elsewhere within the NIHR infrastructure.

- **Overall amount of expenditure on training for this year**

The total expenditure on training and conferences during 2016-2017 was £14246.75 (NB - this does not include staff time costs).

7. LINKS WITH INDUSTRY (no more than two pages)

7.1 Please outline your Unit's progress against its strategy for engaging with industry, separately as appropriate in the following sectors: with i) pharma, ii) biotech, iii) medtech/devices, iv) *in vitro* diagnostics, v) CRO's, vi) non-life sciences companies. For each sector please describe any significant successes or any challenges faced during financial year 2016/17. Please also outline any strategic plans for increasing engagement with industry that are not outlined in your application.

- The NIHR i4i award 'Evaluation and validation of a breath ammonia measurement technology for the improved management of patients with urea cycle defects', is finally underway with the appointment of a research manager in April 2017. We have faced very significant delays in progressing this study, awarded in autumn 2015 due to Intellectual Property discussions between NIHR and our industry collaborators. The BRU (now BRC theme) will house this study for proximity of database management, qualitative/quantitative researchers and dietetic support. Within the scope of this project we have now included (at no extra i4i cost), metabolomics on dietary manipulation in these conditions (new collaboration with Professor Gary Frost: Imperial College London. Faculty of Medicine: Nutrition and Dietetics) and additional qualitative work on living with urea cycle defects. NIHR should be aware, that such prolonged negotiations potentially had deleterious effects on project delivery although we have developed a new and functioning study timeline.
- The FADES cohort has attracted the attention of a British/Norwegian biotechnology company Pharmasum Therapeutics (www.pharmasum.com). After visiting the BRU in the autumn of 2016, a memorandum of understanding was agreed and JH-S has agreed to be a medical adviser for potential novel tyrosine kinase inhibitors developed to prevent a number of complications of Down's syndrome (including autoimmunity and Alzheimer's).
- We have forged a new relationship with an app developer, CEO Julian Laval at www.distillr.com with whom we hope to develop a 'Next-gen logbook, suggestions platform, and collaborative care tool' for adolescents with type 1 diabetes.
- We now have a memorandum of understanding with HACH (www.hach.com) to use a standard industry tool to assess dehydration in those on TPN and in elderly care homes. This represents an innovative use of an already well-established device into healthcare
- Very recently, we have taken up an offer furnished via NOCRI to work with a company Seven Stones (https://sevenstones.co.uk) in the development of activity apps to improve physical activity/reduced sedentary time in those with a numbers of relevant chronic disorders.

7.2 Please indicate the total number of UK Small and Medium Enterprises (SMEs) you have worked with during financial year 2016/17 and provide brief details of key examples. Please list ALL UK SMEs that you have worked with during 2016/17 in the Finance & Activity Report (*BRU Finance & Activity Report 2016-17.xls).*

In the last year, we have worked with a total of three new, UK Small and Medium Enterprises whilst continuing work with three of our previous contacts. We have completed work with two other companies.

7.3 Please provide details of: i) any new strategic partnerships between your Unit and industry during financial year 2016/17 ii) the progress of ongoing strategic partnerships between your Unit and industry during financial year 2016/17. Please list all new strategic partnerships between your Unit and industry during 2016/17 in the Finance & Activity Report (*BRU Finance & Activity Report 2016-17.xls).*

1. Continuation of FADES cohort recruitment to explore difficulties in breast-feeding in infancy, early formula feeding, antibiotic usage and the developing microbiome, metabolome and autoimmune profile. New industry partner – *Pharmasum Therapeutics* (memorandum of understanding) identified our study through BRU FADES website.
2. Support feasibility studies for new medical devices in children with chronic nutrition-related disease (extending our device development programme and testing with UK SMEs).
   New examples include a
   a. Diabetes Robot 'Robin' for child diabetes management education, (Collaboration with University of Hertfordshire).
   b. An adolescent self-management app *'Distillr'*,
   c. A series of activity apps (*Seven Stones* – NOCRI introduction) for deployment within certain disease groups (diabetes, cancer, childhood asthma, diabetes, FH)

3. Dr Elanor Hinton spent six-months part-time in the Medical Affairs team of the Advanced Medical Nutrition arm of Nutricia. Dr Hinton was initially tasked with researching for a new trial of malnutrition in patients with chronic obstructive pulmonary disease (COPD). This report has been developed into a narrative review for publication. It was concluded that more research was needed to inform any new trial of malnutrition in COPD, therefore Dr Hinton designed a brief questionnaire for GPs regarding their views and usage of oral nutritional supplements (ONS), both in general and for COPD patients more specifically. An abstract has been prepared for BAPEN conference based on the findings. Dr Hinton also designed a 12 week self-report project for patients with COPD to record their experiences and usage of ONS, diet and health. The experience has fostered the relationship between the Nutrition BRU and Nutricia, such that plans are in progress to continue this connection further through new internships or PhD studentships.

7.4 Please provide brief details of key examples of studies active in financial year 2016/17, as follows:

- **Contract commercial trials**
- **Industry collaborative research studies**
- **Other academic commercial research**

(1) Evaluation and validation of a breath ammonia measurement technology for the improved management of patients with urea cycle defects (Breath Dx UK) – Study started April 2017

(2) Evaluation of bio-impedance device for evaluation fluid shifts (extra cellular/intracellular fluid) in diabetic ketoacidosis in children with type 1 diabetes to ensure safer resuscitation. (Maltron) – Continuing – paper written on initial study

(3) Study of user decision making subsequent to using health kiosk within United Bristol Hospitals NHS Foundation Trust: analysis of study data currently underway (Wellpoint) – completed: paper submitted

(4) Pilot study to evaluate the performance of the DNA Genotek Stool Collection Kit compared to a standard stool self-collection kit for microbiome analysis (Genotek). Completed – paper ready for submission

(5) New studies from work conducted within BRU are underway in planning stages with HACH, Distillr, Robin the diabetes robot (http://www.emotion-modeling.info/robin), Seven Stones.

7.5 Please provide the number and key examples (including names of funder/grant schemes) of any partnerships or studies with industry which have led to further industry, public or charity research funding, including as part of consortia.

No work to report

7.6 Please provide the number of Agreements signed with industry during financial year 2016/17 and provide brief details of key examples, as follows:

- **Non-Disclosure Agreements**
- **Model Trial Agreements including mICRA and mCTAs**

Number of agreements signed with industry:	
Non-Disclosure Agreements	3
Model Trial Agreements including mICRA and mCTAs	0

8. LINKS WITH OTHER NIHR INFRASTRUCTURE (no more than one page)

Please specify the type and the number of other NIHR infrastructure collaborations (*e.g.* with other BRCs and BRUs, Clinical Research Facilities (CRFs), Healthcare Technology Co-operatives (HTCs), Collaboration for Leadership in Applied Health Research Centres (CLAHRCs), Diagnostic Evidence Co-operatives (DECs), Translational Research Partnerships (TRPs), NIHR BioResource, NIHR National Biosample Centre, MRC/NIHR Phenome Centre, Experimental Cancer Medicine Centres (ECMCs), Clinical Research Networks (CRNs), Dementia Translational Research Collaboration (D-TRC), Rare Disease Translational Research Collaboration (RD-TRC) and the Patient Safety Translational Research Centres. Please also outline any strategic plans for increasing engagement with these NIHR Infrastructure schemes.

We continue to assist/lead NIHR grants in two diseases related to chronic disease in childhood.

a. EME (Treatment of Barth syndrome by CARDIOlipin MANipulation (CARDIOMAN): A randomised placebo-controlled pilot trial conducted by the nationally commissioned Barth Syndrome Service). £440,000 awarded. This is a randomised trial with qualitative and clinical input from BRU.

b. i4i Award. Feasibility study of breath ammonia device to manage children with the nutritionally treated diseases of the urea cycle (AmBeR). Industry collaboration with Breath UK. Hamilton-Shield PI with *Breath Dx* (UK SME) as partner: £750,000..

A further NIHR Clinical (Dietician) PhD will collaborate with Loughborough/Leicester BRC (Professor David Stensel) in a project entitled 'Diet and exercise intervention to improve blood lipid and lipid fractions in young people and their affected parent with familial hypercholesterolaemia: a feasibility study' starting in September 2017.

We continue to host an NIHR Rare Disease Translational Research Collaboration research fellow - Ethan Sen – who is working on nephrotic syndrome. His supervisor Professor Moin Saleem is now a BRU affiliate. Bristol is also a collaborator in another NIHR Rare Disease consortium proposal in Type 2 diabetes in children.

Rachel Perry, Dr Charlotte Atkinson and Professor Andy Ness are working with Dr Maria Pufulete in the Bristol Cardiac BRU (now the cardiovascular theme in the BRC) on a joint BRU project in pre-surgical care.

Dr Sam Leary, with Dr Jessica Harris set up a joint statistics group in 2013 with the NIHR Bristol NIHR Biomedical Research Unit for Cardiovascular Disease which has expanded to include CLAHRC West and the two Bristol Clinical Trials Units. The group meets quarterly. Dr Sam Leary is also member of the NIHR Statistics Group

Directors, Managers and Training leads from Bristol Nutrition BRU, Leicester-Loughborough Nutrition BRU and the Southampton BRC hold regular meetings supported by and attended by NOCRI. We rotate the location between the three groups to share plans, progress and policies.

This gives managers, training and PPI leads the opportunity to exchange ideas giving added value and synergy to the three groups. In addition, the Bristol Nutrition BRU, the Leicester- Loughborough Nutrition BRU and the Southampton BRC Directors and Managers engage in a monthly teleconference. The 3 groups have produced a joint document "Nutrition and Physical Activity Collaborative 2012-2016, acknowledged by NOCRI and now shared on our individual websites.
http://www.uhbristol.nhs.uk/media/2556091/npa_collaborative_bru__4_.pdf

Please also outline any strategic plans for increasing engagement with these NIHR Infrastructure schemes.

We will continue to work with other local NIHR infrastructure such as CLAHRC West. We plan to continue the collaboration with BRC themes in nutrition in the BRCs in Southampton and Leicester/Loughborough and we plan to broaden this to include NIHR funded nutrition researchers based at Imperial College and Cambridge. We will also continue to support the cancer and nutrition NIHR infrastructure collaboration.

9. IMPACT IN HEALTHCARE PROVISION (no more than one page)

Please list any significant new work showing how your Unit is translating its work into practice for the benefit of patients within your Trust and influencing its translation further afield; you may also summarise significant developments in examples reported previously.

No new work to report.

Please also describe examples of work which has significant potential to improve patient outcomes or experiences in the future, setting out how the Unit plans to ensure that these potential benefits are realised.

Service impact example:

- We published a paper questioning the need for yearly cholesterol screening within the National Paediatric Diabetes Audit (NPDA). Hypercholesterolaemia screening in Type 1 Diabetes: a difference of opinion. Candler T, Mahmoud O, Edge J, Shield JH. Diabetic Medicine. 2017 Feb 1. doi: 10.1111/dme.13322. [Epub ahead of print]. Dr Toby Candler (BRU affiliate) also presented the data at the Annual British Society for Paediatric Endocrinology and Diabetes meeting in November 2016. This study demonstrated that screening was unnecessary as there was no consensus regarding sampling framework (fasting or non-fasting), abnormal levels or treatment thresholds. The current audit data collection for the coming year no longer includes annual cholesterol screening.

- We have reported to Dr Judith Richardson - deputy director of NICE regarding Quality Standard 94 adherence in some large DGHs in the South-West. QS 94 deals with, 'Obesity in children and young people: prevention and lifestyle weight management programmes'. Lead by a medical student in her fourth year at the University of Bristol (Miss Alice James), we assessed QS1-3 in this document relating to Vending machines (1), Nutritional information on food for sale (2) and prominent placement of healthy options (3) in all NHS and LA premises. Are food and drink retailers within NHS venues adhering to NICE guidance on childhood obesity? by A. James, L. Birch, P. Fletcher, S. Pearson, C. Boyce, A. Ness, J. Hamilton-Shield and F.E. Lithander, has been submitted to the British Medical Journal. *Therapeutics*.

10. SUMMARY OF PROGRESS MADE (2012-17)

In no more than <u>two pages</u>, please describe how your Unit has progressed against the original objectives set at the start of the contract period, including any changes to the original strategy and reasons for this. Please also provide an overview of any significant issues encountered in the setting up, running and strategic development of the Unit during the course of the whole contract period and any lessons learnt.

Our vision was to "translate causal associations in nutrition drawn from population and clinical studies into interventions for people with conditions related to (or compromised by) poor or sub-optimal nutrition." Our overall aims of the Unit to achieve this vision were "to provide a focus for nutrition and lifestyle research in clinical populations in Bristol…" and to "create an integrated programme of nutrition research." We described our progress towards these aims in our annual report last year. We believe that we have been successful in these aims and describe our progress in terms of creating the unit, academic metrics and supporting activity and building partnerships

- **Creating a Biomedical Research Unit –** once we had agreed space and recruited staff to the unit we focused on setting up key activities such as training, patient and public involvement and public engagement. We identified a member of staff to lead each of these activities and we drafted a policy to guide our activity in these areas that included a process of regular review. As a result these functions were running smoothly within the first two years of the unit opening. This helped to create a sense of identity and shared purpose for unit staff but also made the unit visible and tangible to nutrition researchers elsewhere. We recruited a core team of staff with methodological expertise in statistics, qualitative research methods, systematic reviews and database management. These staff worked across themes and helped to build links between our research themes. They were also available to support collaborators from outside the unit allowing them to design and conduct feasibility studies. Finally, we created the role of affiliate to recognise the important contribution of collaborators to the success of the unit. We arranged affiliates meetings and included details of them on our website. By doing this we created a community of scientists and clinicians interested in nutrition research who felt part of the unit.

- **Ensuring academic outputs** – we have been productive in terms of scientific activity and output. We ran around 100 projects in the unit. We created the term project to describe specific activities within themes and created a brief project proposal form to allow us to monitor activity in the unit. We reviewed all project forms at our executive meetings and posted a copy of the abstract on the unit website. We recruited around 2,000 participants into studies run by the unit. We analysed data from existing studies to inform the work of our themes but we did not include these numbers in our recruitment numbers. We supported a number of small feasibility or pilot grants by working in partnership with investigators and by providing access to key methodologists we ensured that grants were awarded and successfully conducted. We also secured larger scale project and programme grant support for clinical nutrition research activity in our themes. We have published 80 papers to date and we have further manuscripts in preparation.

- **Supporting activity and building partnerships** – we provided a base for relevant NIHR related activities. These included a randomised trial of chewing gum in people having colorectal surgery, a cross sectional survey in children with cleft lip and palate (Cleft Care UK), a DNA backed prospective clinical cohort in people with head and neck cancer (head and neck 5000) and surgical research team of 5 full time equivalent research nurses and two data co-ordinators recruiting to portfolio and commercial studies. We also built partnerships with NIHR clinical nutrition researchers in the Southampton BRC and the Leicester/Loughborough BRU. We have recently extended this to include researchers at Imperial College and Cambridge. We have discussed research ideas, training plans and provided free places on our respective courses.

In addition, please include:

- **a list of up to five impacts achieved as a result of the NIHR BRU funding over the last five years (no more than 200 words each); and**
- **a list of your top 10 publications over the last five years.**

Impacts

- **Comprehensive training programme with a focus on dieticians –** we have run a successful comprehensive training programme that has supported dieticians at all levels. For example, one of our staff was recently awarded an NIHR Integrated Clinical Academic Programme – Clinical Doctoral Research Fellowship (C-DRF).

- **Policy relevant systematic reviews** – we have completed systematic reviews on important issues in clinical nutrition such as the role of low energy sweeteners in obesity, omega 3 fatty acids in clinical depression and chewing gum in prevention of post-operative ileus.

- **Programme funding to support clinical nutrition research** – we have secured programme funds to extend work in our research themes.

- **Established industry partnerships in clinical nutrition** – we have built a programme of industry partnerships that have resulted in the award of a large i4i project grant.

Publications

1. Brocklebank LA, Falconer CL, Page AS, Perry R, Cooper AR. The associations of objectively-measured total sedentary time and breaks in sedentary time with cardiometabolic biomarkers: a systematic review. Preventive Medicine 2015: Jul 76; 92-102.

2. Short V, Herbert G, Perry R, Atkinson C, Ness AR, Penfold C, Thomas S, Andersen HK, Lewis SJ. Chewing gum for postoperative recovery of gastrointestinal function. Cochrane Database Systematic Review 2015: Feb 20; (2):CD006506

3. Hackshaw-McGeagh LE1, Penfold CM, Walsh E, Donovan JL, Hamdy FC, Neal DE, Jeffreys M, Martin RM, Lane JA; ProtecT Study Group. Physical activity, alcohol consumption, BMI and smoking status before and after prostate cancer diagnosis in the ProtecT trial: Opportunities for lifestyle modification. International Journal of Cancer 2015: Sep 15;137(6):1509-15

4. Er V, Athene Lane J, Martin RM, Emmett P, Gilbert R, Avery KN, Walsh E, Donovan JL, Neal DE, Hamdy FC, Jeffreys M. Adherence to dietary and lifestyle recommendations and prostate cancer risk in the Prostate Testing for Cancer and Treatment (ProtecT) trial. Cancer Epidemiology, Biomarkers & Prevention 2014: Oct; 23(10): 2066–2077.

5. Majbar AA, Cusick E, Johnson P, Lynn RM, Hunt LP, Shield JP. Incidence and Clinical Associations of Childhood Acute Pancreatitis. Pediatrics 2016: Sep;138(3).

6. Ryninks K, Sutton E, Thomas E, Jago R, Shield JP, Burren CP. Attitudes to Exercise and Diabetes in Young People with Type 1 Diabetes Mellitus: A Qualitative Analysis. PLoS One 2015: Oct 14;10(10)

7. Potter C, Ferriday D, Griggs RL, Hamilton-Shield JP, Rogers PJ, Brunstrom JM. Parental beliefs about portion size, not children's own beliefs, predict child BMI. Pediatric Obesity 2017: Apr 4 [Epub ahead of print]

8. Falconer C L, Cooper A R, Walhin J P, Thompson D, Page A S, Peters T J, Montgomery A A, Sharp D J, Dayan C M, Andrews R C. Sedentary time and markers of inflammation in people with newly diagnosed type 2 diabetes. Nutrition, Metabolism & Cardiovascular Diseases 2014: Sep;24(9):956-62

9. Rogers PJ, Hogenkamp PS, de Graaf K, Higgs S, Lluch A, Ness AR, Penfold C, Perry R, Putz P, Yeomans MR, Mela DJ. Does low-energy sweetener consumption affect energy intake and body weight? A systematic review, including meta-analyses, of the evidence from human and animal studies. International Journal of Obesity 2016: Mar;40(3):381-94

10. Appleton KM. Sallis HM, Perry R, Ness AR, Churchill R. Omega-3 fatty acids for depression in adults. Cochrane Database Systematic Review. 2015 Nov 5;(11):CD004692.

11. OTHER COMMENTS (no more than one page)

Please use this space to provide us with any other information you would like to highlight, or comments you would like to make.

This form, together with the BRU Financial & Activity Report and an Added Value pro forma (using the structured template provided) must be submitted, by email, no later than **1pm on Thursday 18 May 2017** to Sonja Tesanovic (sonja.tesanovic@nihr.ac.uk).

A signed copy of this report should be sent no later than **Friday 26 May 2017** to:

Dr Sonja Tesanovic
NIHR Central Commissioning Facility
Grange House
15 Church Street
Twickenham, TW1 3NL