

# *Case study: co-creating NANA (Novel Assessment of Nutrition and Ageing) with older adults living at home*

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# Chapter 24

## Case Study: Co-creating NANA (Novel Assessment of Nutrition and Ageing) with Older Adults Living at Home



Arlene J. Astell, Tim Adlam, Faustina Hwang, and Liz Williams

### The Challenge

Older people face a high risk of nutrient deficiencies and malnutrition, which increases risk of sarcopenia (loss of muscle mass and strength) and other health-related problems. Avoiding late-life malnutrition is dependent on a number of factors including physical, mental, and cognitive health. Monitoring all of these factors and the interactions between them is challenging, especially for people living at home. Dietary intake, for example, has traditionally used pen and paper recall and recording of what people eat (e.g., food log, food diary), which relies heavily on memory. In addition, gold standard measures of cognition are designed for one-off assessment, administered by a trained clinician or researcher. Developing an accessible tool that older people can use at home on a daily basis to monitor what

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they eat and drink, their mood, cognition, and physical activity could reassure them how they are doing and provide early detection of emerging problems.

The NANA (Novel Assessment of Nutrition and Ageing) project set out to co-create a digital tool with older adults that they could use at home on a daily basis. A team of nutritionists, psychologists, engineers, and human-computer interface experts developed a comprehensive program to facilitate cooperation between the relevant stakeholders and ensure maximum input at every stage. This comprised three key elements: (1) *Whole project management*, where every part of the project is seen in its relation to the whole, i.e., part of delivering the NANA tool kit—rather than in disciplinary or work package silos; (2) *Transdisciplinary working*, where team members from different disciplines work together, across boundaries, for example, an engineer and nutritionist running a technology focus group; and (3) *Partnership with older adults*, whereby older adults iteratively co-create the different aspects of the project (Astell et al., 2018).

This partnership approach influenced the project design and resulted in us carrying out a total of 44 sub-studies ranging from working with two individuals in their own homes to examine the usability of a video camera for recording their daily food and drink to the full NANA tool kit evaluation in 40 individuals' homes (Astell et al., 2014). These 44 sub-studies were organized in three phases:

## **Phase 1 User needs analysis**

The first phase comprised 12 sub-studies: seven focus groups—three with older adults, two with nutrition professionals, and two with other health professionals—plus five field studies with older adults: (1) evaluating currently available smart phones on the high street, (2) feasibility of older adults recording their food and drink using digital photography, (3) video camera, (4) early mock-ups of the NANA interface, and (5) acceptability of and preferences for different sized touch screens in the home.

## **Phase 2 Development of Integrated Measurement Tool Kit**

This phase comprised 26 sub-studies informed by the findings from Phase 1 across three integrated strands: (1) iterative design and development of the measurement tool kit, (2) dietary validation studies, and (3) cognition and mental health validation studies. In brief, these sub-studies were: food recording (Brown et al., 2018), food weighing (Timon et al., 2015), portion size estimation (Astell et al., 2018), activity monitoring (Astell et al., 2014), gait (Brown et al., 2016), cognition and gait (Astell et al., 2018), cognition and mood (Astell et al., 2018), grip strength (Timon et al., 2015), tool kit configuration (Brown et al., 2016), and two validation studies: nutrition (Astell et al., 2018) and diet, mood, and cognition (Astell et al., 2018).

## Phase 3 Full Tool Kit Validation

The third phase of the project included four sub-studies including the main validation study comparing the NANA tool kit with the best pen and paper methodologies and against independent biochemical markers of nutrient status. Three other sub-studies are: comparison of methods of collecting gait data in the home setting, potential for steadying the older adult's gait, and a final focus group with older adults and health care staff to discuss the potential application of the data collected by the NANA system. The NANA project directly involved 533 older adults (aged between 65 and 91 years) plus dietary information from another 217, along with 53 nutritionists as well as 15 health professionals and 90 adults under 65 years of age.

## Outcomes and Impact

The major outcome was the validated NANA tool kit that older adults can use at home to keep track of their food and drink, cognition, mood, and physical activity (Astell et al., 2014). This comprises a new digital method for capturing accurate dietary information (Timon et al., 2015); novel, reliable, repeatable cognitive measures (Brown et al., 2016), which are used along with new daily mood measures (Brown et al. 2018), which can predict future depression (Andrews et al., 2017). Through the COBALT (Innovate UK, 2011–2013) and TUNGSTEN (AGE-WELL) (Aging Gracefully across Environments using Technology to Support Wellness, Engagement and Long Life)

Network of Centres of Excellence, 2015–2020 projects we have translated the NANA transdisciplinary approach into co-created activities for technology developers to partner with older adults as experts (<http://tungsten-training.com/>). A mobile version of the NANA nutrition module was co-created with younger adults with intellectual disability in the CANDI project (Sirona Foundation 2015–2016). The complete NANA tool kit has been co-developed into DataDay, a mobile self-management application for people living with dementia with funding from AGE-WELL and CABHI (2017–2019). DataDay is currently in beta testing with a view to commercialization in 2019.

### Key Messages

- Older adults are experts in their needs, preferences, and priorities.
- Partnering with older adults is key to producing accessible, practical products, and services that people want to use.
- Daily monitoring can provide reassurance and early detection of problems.

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Investigator with Co-investigators Dr. Tim Adlam (Designability and University of Bath [United Kingdom]), Dr. Faustina Hwang (University of Reading [United Kingdom]), and Dr. Liz Williams (University of Sheffield [United Kingdom]). Dr. Laura Brown (St. Andrews), Dr. Alan Godfrey (Reading), and Dr. Sarah Cooper (Sheffield) were the NANA postdoctoral researchers. Hassane Khadra was the NANA engineer (Designability) and Tom Smith (Reading) was the NANA programmer. Dr. Lin Maclean (St. Andrews) and Dr. Claire Timon (Sheffield) were the NANA Ph.D. students. Sanctuary Care Ltd. and Age UK were partners in the project, with Age UK hosting the NANA Advisory Group, chaired by Professor Peter Lansley (Reading).

## References

- Andrews, J., Harrison, R., Brown, L. J. E., MacLean, L. M., Hwang, F., Smith, T., ... Astell, A. J. (2017). Using the NANA tool kit at home to predict older adults' future depression. *Journal of Affective Disorders*, *213*, 187–190.
- Astell, A. J., Hwang, F., Brown, L. J. E., Timon, C., Maclean, L. M., Smith, T., ... Williams, E. A. (2014). Validation of the NANA (Novel Assessment of Nutrition and Ageing) touch screen system for use at home by older adults. *Experimental Gerontology*, *60*, 100–107.
- Astell, A. J., Williams, E. A., Hwang, F., Brown, L., Cooper, S., Timon, C., ... Godfrey, A. (2018). NANA: A tale of ageing and technology. In A. Walker (Ed.), *The new dynamics of ageing* (Vol. 2, pp. 157–176). Bristol: Policy Press.
- Brown, L. J., Adlam, T., Hwang, F., Khadra, H., Maclean, L., Rudd, B., ... Astell, A. J. (2016). Computer-based tools for assessing micro-longitudinal patterns of cognitive function in older adults. *Age*, *38*(4), 335–350.
- Brown, L. J., Adlam, T., Hwang, F., Khadra, H., Maclean, L., Rudd, B., ... Astell, A. J. (2018). Computerized self-administered measures of mood and appetite for older adults: the Novel Assessment of Nutrition and Ageing (NANA) tool kit. *Journal of Applied Gerontechnology*, *37*(2), 157–176.
- Timon, C. M., Astell, A. J., Hwang, F., Adlam, T. D., Smith, T., Maclean, L., ... Williams, E. A. (2015). The validation of a computer-based food record for older adults: the Novel Assessment of Nutrition and Ageing (NANA) method. *British Journal of Nutrition*, *113*(4), 654–664.