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**Article:**

Llewellyn, CH and Fildes, A [orcid.org/0000-0002-5452-2512](https://orcid.org/0000-0002-5452-2512) (2016) *In memoriam. Jane Wardle*. *Appetite*, 99. C. A1-A2. ISSN 0195-6663

<https://doi.org/10.1016/j.appet.2016.01.008>

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## **OBITUARY: PROFESSOR JANE WARDLE**

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Word count: 1262

Professor Frances Jane Wardle, known to everyone as Jane, died on 20<sup>th</sup> October 2015 in London just before her 65<sup>th</sup> birthday. Jane was an outstanding behavioural scientist whose work revolutionised our understanding of obesity.

Jane gained an undergraduate degree in Psychology and Physiology from St Anne's College Oxford in 1973. She then trained as a clinical psychologist at King's College London's Institute of Psychiatry, before swiftly climbing to the position of Lecturer at the young age of 26. From the earliest stage in her career she was fascinated by eating behaviour, but initially her research focused on eating disorders at the individual level. In 1991, she moved to the Imperial Cancer Research Fund Health Behaviour Unit where she expanded her interests into understanding the role of appetite in obesity, and how to change eating behaviour to promote health at the population level.

In 1996 she moved the unit to University College London, where it flourished under her directorship, expanding rapidly from a dozen people to over 70 members of staff and students. The Unit was largely supported by programme grants from Cancer Research UK because of the important link between weight and cancer. Jane endeavoured to advance our understanding of the aetiology of obesity, with the hope that insights might eventually lead to successful prevention and management techniques. She was unique in combining behavioural science with genetic epidemiology to transform our understanding of the genetic basis of human body weight.

Although we have known for many years that weight has a strong genetic basis, with twin studies estimating heritability to be as high as 90%, Jane established that weight is as

heritable now as it was 30 years ago (Wardle, Carnell, Haworth, & Plomin, 2008); despite the large increases in population weight that have occurred since the onset of the obesity epidemic. This observation has been difficult for obesity researchers to reconcile with the radical changes to the food and activity environments that are widely believed to have caused the recent epidemic. Researchers were confronted with a seeming paradox of both genetic and environmental determination weight.

Professor Wardle developed Behavioural Susceptibility Theory to explain how this is possible. She proposed that genes are influencing weight, at least partly through effects on appetite. The key idea was that individuals who inherit a set of genes that make them more responsive to food cues (want to eat when they see, smell or taste delicious food), and less sensitive to satiety (take longer to feel full) are more susceptible to overeat in the current food environment, and therefore more likely to become obese.

She developed a parent-report measure of children's appetite – the widely used Child Eating Behaviour Questionnaire [CEBQ] (Carnell & Wardle, 2007; Wardle, Guthrie, Sanderson, & Rapoport, 2001) – and explored the genetic basis of appetite using 10-year-old twins from The Twins Early Development Study (TEDS). Researchers have long used twins to quantify the relative importance of genes versus environment, by comparing resemblance between monozygotic and dizygotic twins. Using the CEBQ she showed for the very first time that food responsiveness and satiety sensitivity both have a strong genetic basis (Carnell, Haworth, Plomin, & Wardle, 2008). She went on to publish two seminal papers showing that variants in the FTO gene (the first common 'obesity gene' to be discovered through a genome-wide association study in 2007), and other genes, appear to be influencing weight

through impacting satiety sensitivity (Llewellyn, Trzaskowski, van Jaarsveld, Plomin, & Wardle, 2014; Wardle et al., 2008).

The observation that much of the genetic expression on weight had already occurred by late childhood led Jane to establish Gemini – the largest study of twins ever set up to study genetic and environmental influences on weight from birth. The Gemini study includes over 2400 British families with twins born in 2007 (van Jaarsveld, Johnson, Llewellyn, & Wardle, 2010). She developed the first psychometric measure of infant appetite – the Baby Eating Behaviour Questionnaire (Llewellyn, van Jaarsveld, Johnson, Carnell, & Wardle, 2011) – to show that variation in both ‘food responsiveness’ and ‘satiety sensitivity’ expressed in early infancy is highly heritable (Llewellyn, van Jaarsveld, Johnson, Carnell, & Wardle, 2010), and appears to be causally associated with infant weight gain (van Jaarsveld, Llewellyn, Johnson, & Wardle, 2011; van Jaarsveld, Boniface, Llewellyn, & Wardle, 2014). Under Jane’s leadership Gemini has become an internationally recognised study that has advanced our understanding of eating behaviour and growth.

As part of Jane’s pioneering work on obesity she envisaged a new age of personalised medicine in which genetic information about individual obesity risk might be provided to improve adherence to prevention advice. Although genetic testing has been available over the internet for some time, the psychological impact of receiving feedback on obesity risk was unknown. She was the first to explore the experience of receiving information about FTO genotype, showing that higher-risk genetic feedback motivated people to ‘battle their biology’ (Meisel & Wardle, 2014). She also developed novel evidence-based methods for weight control such as Ten Top Tips, a low-intensity habit-based behaviour change

intervention in the form of a leaflet (Beeken et al., 2012). Jane believed that this type of intervention, which requires very little time to explain and is easy to understand, could be particularly beneficial for primary care where time is short, and effective advice for weight management is needed. She set up the UK charity Weight Concern (<http://www.weightconcern.org.uk/>) whose aims are to promote healthy eating and weight through evidence-based methods.

In her lifetime Jane produced over 700 publications, 100 of which were written in the last two years alone, and trained over 40 PhD students. Aside from her vast catalogue of obesity research Jane also made major contributions to the fields of cancer screening, early diagnosis and survivorship. In fact, she joked that at a recent cancer conference another professor thought she had a namesake in the field of obesity, finding it difficult to conceive of an individual with world-leading research programmes spanning two major fields. She was one of a handful of scientists to have been elected to both The British Academy, and the Academy of Medical Sciences, and was given the British Psychological Society award for outstanding contribution to research in 2014. Her eminent career was even more impressive given her turbulent early years. Her family life was unstable, with an often absent father and a mother who spent lengthy spells in hospital with mental illness. She attended 13 schools before presenting herself to Oxford High School at the age of 16, convincing the then headmistress Mary Warnock to take her on and waver the fees; Jane had an incredible ability to dazzle people with her charm.

Jane was an outstanding mentor and teacher, unusual in combining the qualities of pragmatism with big ideas. She was extraordinarily generous scientifically as well as personally, inspiring unwavering loyalty among her many students and colleagues. Scientific

rigour and personal integrity were attributes she instilled in the many scientists she trained; leading by example, she showed that it is possible to rise to the top through sheer brilliance and honesty. As well as having an incisive and creative mind, she was known for her wicked sense of humour, and her love for gossip, style and parties.

Jane was diagnosed with chronic lymphocytic leukaemia at the age of 46. She lived with this diagnosis with few problems for nearly 20 years. She eventually died from its complications in October 2015. She was devoted to and remains adored by her husband Professor Andrew Steptoe, also a scientist at University College London, her daughter Lucy, her son Matt, her stepson Will, and her three grandchildren.

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