

Institution: Cardiff University		
Unit of Assessment: Psychology, Psychiatry and Neuroscience (4)		
Title of case study: Improving fertility knowledge through policy change in Japan		
Period when the underpinning research was undertaken: 2005-2018		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s): Jacky Boivin Laura Bunting	Role(s) (e.g. job title): Professor Research Associate	Period(s) employed by submitting HEI: 05/08/1995 - present 16/02/2009 - 31/07/2013
Period when the claimed impact occurred: 2013-2020		
Is this case study continued from a case study submitted in 2014? No		
1. Summary of the impact (indicative maximum 100 words) Cardiff research revealed that a lack of fertility knowledge is negatively affecting fertility health within populations and that, crucially, it is possible to increase this knowledge to directly improve fertility outcomes. This impact case focuses on application of this research in Japan, where the birth rate is in crisis, from a steady decline over the past 50 years. Cardiff research showing very poor fertility knowledge in Japan versus other developed nations made headlines in Japan and led the Japanese Government to implement fertility education initiatives in schools and community settings. These educational initiatives led to improved fertility knowledge and in turn, accelerated births.		
2. Underpinning research (indicative maximum 500 words) 2.1 Assessing global fertility knowledge using the Cardiff Fertility Knowledge Scale Since 2005, Cardiff University's Professor Boivin and her team have been exploring the link between fertility knowledge and fertility itself. This research led the team to develop the Cardiff Fertility Knowledge Scale (CFKS), a tool that enables measurement of fertility knowledge within a population and population subgroups. The CFKS is a 13-item questionnaire that generates a percentage correct score. It covers knowledge about facts, risk factors and myths about infertility [3.1]. The CFKS was noted in our 2014 Impact Case Study which focused on three other tools the Cardiff team developed around infertility: FertiSTAT (a fertility awareness tool); FertiQoL (a quality-of-life tool); and PRCI (a tool for managing stress during assisted reproduction). In 2009, Boivin led the International Fertility Decision-making Study (IFDMS), a survey of 10,045 people of childbearing age in 18 countries, which explored levels of fertility knowledge (including the signs, symptoms and preventable causes of infertility) using the CFKS [3.1, G3.1]. This study enabled rates of fertility knowledge to be compared between countries; it revealed that fertility knowledge was substantially lower in Japan (mean 34%) than in any other developed country (average 64%). This finding was particularly worrying alongside Japan's known low birth rates: in 2012, the Total Fertility Rate was 1.41, far below the rate of 2.1 needed to sustain Japan's target population. Further, the last time Japan's fertility rate was above 2.1 was in 1973 (UN World Population Prospects). Cardiff's research was presented at the European Society for Reproduction and Endocrinology (ESHRE) 2010 conference ahead of publication, resulting in substantial media attention in Japan focused on the nation's comparatively low fertility knowledge score. Via this media coverage, the Japanese Government advisory board for low fertility learned about Cardiff's research findings and recommended the distribution of leaflets in an attempt to boost its population's fertility knowledge.		
2.2 Tailoring the CFKS to Japan Following the results of the IFDMS study, indicating poor fertility knowledge amongst Japanese people who were actively trying to conceive, Boivin was instrumental in a follow-up		

study in Japan using a Japanese version of the CFKS (CFKS-J). This aimed to enhance the data collected in the original study by sampling the general population alongside those already trying to conceive [3.2, G3.2], an important requirement to inform any subsequent public education initiatives. The results of this follow-up study were published in 2015 [3.2] and highlighted that fertility knowledge in Japan could be increased. Specifically, “Educational interventions, both in schools and in the community, may be needed to increase fertility knowledge in the general population because most people obtain fertility knowledge from mass media, which has been shown to often present distorted and inaccurate fertility information” [3.2, p1]. The study recommended that “the educational interventions should target schools and the community to be the most effective” [3.2, p10]. The study concluded that the research provided policy makers with important background for improving school-based and community educational initiatives undertaken in developed countries [3.2].

2.3 Demonstrating an effect of education on knowledge and birth-rate

The results of the IFDMS survey were also examined to establish how fertility knowledge affected reproductive decisions. While overall fertility knowledge levels in Japan were low, a proportion of respondents had sufficient knowledge to correctly identify the statement, “A woman is less fertile after the age of 36 years”, as true. These people were subsequently asked about the age at which they had first acquired that knowledge. Those who answered “≥10 years before” were classified as having “past fertility knowledge”. Within this group, only 2.5% of women had delayed having their first baby until after 35 years, compared to 16.3% of women who had no past fertility knowledge. This evidenced that education in early adulthood about the facts of fertility was related to starting a family at an earlier age [3.3].

Extending this work, in 2015, Boivin, together with her Japanese research collaborators, examined the effect of improved fertility education on the fertility knowledge of 1,455 Japanese men and women of childbearing age who intended to have children. The effect of fertility education (provided to an intervention group) was compared to provision of information about folic acid supplementation and Government financial support for pregnancy and childrearing (provided to control groups). The researchers found that knowledge about fertility increased following fertility education, but not in the other control groups [3.4].

3. References to the research (indicative maximum of six references)

[3.1] Bunting, L. E., Tsibulsky, I., and Boivin, J. (2013). Fertility knowledge and beliefs about fertility treatment: findings from the International Fertility Decision-making Study. *Human Reproduction*, 28(2), 385-397. DOI: 10.1093/humrep/des402

[3.2] Maeda, E., Sugimori, H., Nakamura, F., Kobayashi, Y., Green, J., Suka, M., Okamoto, M., Boivin, J. and Saito, H. (2015). A cross sectional study on fertility knowledge in Japan, measured with the Japanese version of Cardiff Fertility Knowledge Scale (CFKS-J). *Reproductive Health*, 12(10). DOI: 10.1186/1742-4755-12-10

[3.3] Maeda, E., Nakamura, F., Boivin, J., Kobayashi, Y., Sugimori, H., Saito, H. (2016). Fertility knowledge and the timing of first childbearing: a cross-sectional study in Japan. *Human Fertility*. 19(4) 1-7. 275-281 DOI: 10.1080/14647273.2016.1239033.

[3.4] Maeda, E., Nakamura, F., Kobayashi, Y., Boivin, J., Sugimori, H., Murata, K., & Saito, H. (2016). Effects of fertility education on knowledge, desires and anxiety among the reproductive-aged population: findings from a randomized controlled trial. *Human Reproduction*, 31(9), 2051–2060. DOI: 10.1093/humrep/dew133

Selected grants:

[G3.1] Bunting, L.E., Boivin, J., and Elwyn, G., Understanding risk and help-seeking in the context of female fertility. Economic & Social Research Council, 01/11/2010-31/07/2013, £179,035. PTA-037-27-0192.

[G3.2] Boivin, J., Examining Japan's low fertility rate by implementing and analysing the results of a Japanese version of the Cardiff Fertility Knowledge scale which will be adapted

using a rigorous procedure. The Daiwa Anglo-Japanese Foundation, 01/01/2014-31/05/2016, £3,000

4. Details of the impact (indicative maximum 750 words)

Via use of the Japanese version of the Cardiff Fertility Knowledge Scale (CFKS-J) in Japan, the Japanese Government for the first time gained detailed understanding of the extent of the gap in fertility knowledge amongst its population, compared to other developed countries. This research enabled the Japanese Government to implement initiatives to improve fertility knowledge and accelerate its live birth rate, as well as the means to measure the improvement in overall knowledge about fertility within the population.

4.1 Leap in public awareness and media coverage about fertility

The results of the International Fertility Decision-making Study (IFDMS) [3.1] were widely reported in Japan, and included a television appearance by Boivin on NHK, Japan's national public-service broadcaster, where she discussed the research findings. The study results were also directly presented to the Government's Advisory Board for Low Fertility in 2013. The extent of the media interest was documented by sociologist Sigeto Tanaka, who detailed [5.1]: *"Professor Boivin...introduced some results from the IFDMS...These programs aroused public interest in infertility and the concept of egg aging [sic]...Since 2013, many books, articles, and online media have featured egg aging. Many of them included the IFDMS to introduce the low level of knowledge about human fertility among Japanese people"* [5.1].

As noted by *The Economist*, the actions to address the knowledge gap in Japan uncovered by the Cardiff research was rapid: "Beginning in 2013, there has also been increased fertility education, and in 2014, the Ministry of Health, Labour and Welfare released a movie about pregnancy and infertility" [5.2 p7].

4.2 Embedding fertility education in Japanese fertility policies

Following Cardiff's research findings and subsequent media coverage, the Japanese Government included fertility education as part of its 2015 policy to tackle the nation's fertility crisis [5.3, 5.4]. Referring to the IFDMS study, the policy stated that it aims to improve fertility knowledge amongst the Japanese population through educational interventions over five years. It cited Cardiff's CFKS-J as the metric by which success will be measured, and sets a score of average 70% fertility knowledge within the population by 2020 as the target. This is in comparison to the mean score of 34% that was obtained in 2013, using the CFKS in the IFDMS study [3.1].

The policy initiated a series of countermeasures to address the knowledge deficit, including a new education programme, as called for by the Cardiff research [3.2]. The policy was announced by the Prime Minister in his presentation to the Upper House on 10 August 2015, where he confirmed that the interventions would be focussed on schools and the community, as recommended in Cardiff's research: *"It has been newly decided to circulate medically and scientifically correct knowledge concerning pregnancy and birth at the level of **school education** and to **members of society**. This new policy shall be steadily implemented, and I will do my utmost to help create a society that is warm and friendly towards marriage, pregnancy, children, and child rearing"* [5.5].

One commentator, Isabel Fassbender (Department of International Studies, Doshisha Women's College of Liberal Arts) (2016) noted that the "[f]indings from the international fertility decision-making study ... provided the impetus to promote ninkatsu ('pregnancy activities')" [5.6, p129]. She emphasised that the "education paragraph [of the policy]...seems central in the context of the countermeasures" [5.6, p130]. For Fassbender, the influence of the education element of the policy was demonstrated by its influence at the top level of government: "Even current Prime Minister Abe Shinzō now emphasizes the importance of the promotion of fertility and reproduction education in order to fight the low birthrate. Before this...[he was] the chairman of a project team that severely criticized the promotion of sex education" [5.6, p130].

4.3 Implementation of fertility education policy in Japan

The 2015 policy enacted interventions across Japan, with nationwide as well as local strategies implemented. Cardiff's findings on the influence of fertility knowledge on reproductive decisions made by Japanese women [3.3], alongside evidence of the positive effect of educational interventions (on fertility knowledge levels and reproductive decision making) [3.4] provided a solid evidence base for public health fertility interventions in Japan. Numerous government educational activities were initiated; these were summarised by Boivin's collaborator, Maeda, in a presentation to the 2018 European Society for Reproduction and Endocrinology (ESHRE) conference, and are described below [5.7].

At a **national level**, the Japan Society of Obstetrics and Gynaecology produced a pamphlet on fertility, which was distributed at "*every opportunity*", such as coming-of-age ceremonies or when notice of marriage was submitted [5.8]. This approach to educating young people is made explicit in the Specific Contents of the Government's 2015 fertility education policy [5.3, 5.4]. Following Cardiff's findings on the importance of early education about fertility [3.3, 3.4], the policy states that the aim of fertility education is: "To make each student able to life-plan and to satisfy their wish regarding starting a family, we will include accurate medical knowledge about pregnancy and childbirth into educational materials and will train school teachers" [5.3, 5.4].

At a **local level**, the Government's education programme included various creative measures aimed at both school and community audiences. As examples of this being implemented in practice:

a. Saitama prefecture

From 2017, in Saitama, as part of the "*Welcome Baby Project*" [5.9], newly married couples in 60 municipalities were provided with a celebration card from celebrity musician and actor Diamond Yukai, who had suffered from male infertility. An accompanying video from the musician shared his story and encouraged the couples to consider fertility awareness [5.7]. Further interventions were made available across the prefecture, including [5.7, 5.9]:

- subsidies for fertility check-ups;
- fertility awareness comics and seminars in schools and cafes;
- a smartphone app with fertility information.

b. Okayama prefecture

From 2017 in Okayama, healthcare workers began teaching fertility awareness in junior and high schools "*to disseminate...correct knowledge of pregnancy and childbirth*" [5.9]. Comics were distributed aimed at helping children to consider their life plans [5.7, 5.9].

c. Oita prefecture

From 2017 in Oita, a focus was placed on workplace fertility workshops delivered by midwives, as well as distribution of over 12,000 fertility comics at school and college events [5.7, examples provided, 5.9].

4.4 Accelerated birth following fertility education

In 2018 Boivin and Maeda revisited the participants of their 2016 RCT, which found that knowledge about fertility increased following fertility education [3.4], to measure fertility knowledge and assess the impact of fertility education on both knowledge and birth rates [5.10]. Trial participants had been given an educational brochure in 2016, which drew heavily upon the content of the Japan Society of Obstetrics and Gynaecology pamphlet used in public fertility education initiatives across Japan [5.8]. Knowledge gain in 1,455 participants was measured immediately after either fertility information ("intervention") or control information was communicated [3.4]. More than half of the original trial participants (743) responded to the two-year follow-up, and there were significant knowledge gains among the intervention

group of “11.2% and 7.0% among men and women, respectively” [5.10, p2035], but “no significant change over time for control groups” [5.10, p2035].

Crucially, the RCT showed that within the intervention group, those who had increased their fertility knowledge following provision of the educational brochure also showed **accelerated births correlating with increase in fertility knowledge**. In their study, 10.6% of partnered women had a new birth within a year of receiving fertility education, compared to only 2.3% of partnered women who received control advice regarding folic acid supplementation [5.10]. This represents a four-fold acceleration in births in Japanese trial participants after fertility education with materials used in national fertility education initiatives. These findings demonstrated that education initiatives, focused on enhancing fertility knowledge, could positively impact Japan’s low birth rate in a relatively short space of time.

In summary, Cardiff research highlighted a deficit in Japanese people’s fertility knowledge, leading to a major government intervention to educate the population about fertility on a large scale, with new national and local education programmes. Collaborative research between Cardiff and Japanese academics subsequently demonstrated that an educational intervention improved fertility knowledge in a Japanese cohort and accelerated the timing of subsequent births. Cardiff’s CFKS-J is now being used by the Japanese government to regularly assess fertility knowledge in its population, aligned to implementation of these fertility knowledge interventions across the country.

5. Sources to corroborate the impact (indicative maximum of 10 references)

[5.1] Sigeto Tanaka, distributed paper at XIX ISA World Congress of Sociology (16 July 2018), Toronto

[5.2] ‘Fertile Ground: How can Japan Raise its Fertility Rate?’, The Economist Intelligence Unit, 2018

[5.3] Japanese Government Policy Document detailing the current CFKS-J score of 34% and the target score of 70% (in Japanese)

[5.4] Policy Appendix 1 Specific Contents

[5.5] Shinzō Abe’s Statement to the Upper House, Aug 2015 (in Japanese, relevant quote highlighted and translation verified by Eri Maeda)

[5.6] Isabel Fassbender (2016), Enhancing autonomy in reproductive decisions? Education about family planning and fertility as a countermeasure against the low birthrate, *Contemporary Japan*, 28:2, 123-144. DOI: 10.1515/cj-2016-0007

[5.7] Eri Maeda presentation to ESHRE Pre-Congress Course (1 July 2018)

[5.8] JSOG Educational Pamphlet (in Japanese)

[5.9] Fertility education resources from Saitama, Okayama and Oita prefectures

[5.10] Maeda, E., Boivin, J., Toyokawa, S., Murata, K., & Saito, H. (2018). Two-year follow-up of a randomized controlled trial: knowledge and reproductive outcome after online fertility education, *Human Reproduction*, 33(11), 2035-2042. DOI: 10.1093/humrep/dey293