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LETTER

Letters to the editor; a possible spurious correlation between human papillomavirus vaccination introduction and birth rate change in the United States

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ABSTRACT

A possible spurious correlation was found between human papillomavirus (HPV) vaccination introduction and birth rate change in the United States. Thus, the effects of HPV vaccination needed to be followed carefully at an international level. The birth rate change in the US might be representative of the trend of the introduction of new contraception methods and advancing maternal age.

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HPV vaccine; fertility rate; statistics; spurious correlation; vaccine hesitancy

We read the paper by DeLong (2018) entitled "A lowered probability of pregnancy in females in the USA aged 25–29 who received a human papillomavirus vaccine.[1]" We speculate that a spurious correlation was observed between human papillomavirus (HPV) vaccination introduction and birth rate change in the United States. In June 2006, two HPV vaccines (Gardasil and Cervarix) were introduced for women aged between 11 and 26 years. The Centers for Disease Control and Prevention published the recommendation in March 2007.[2] The birth rate in women aged 25 to 29 years has declined from 2007, and the article argued that the introduction of HPV vaccine could have affected the birth rate in the United States.

First, the HPV vaccine is recommended mainly for women before being sexually active. Routine vaccination with HPV is recommended for girls aged 11–12 years, and the catch-up vaccination is recommended for girls aged 13–26 years. The vaccination rate of HPV vaccine in girls aged 13–17 years was 25.1% in 2007,[3] but that rate was only 10.5% in women aged 19–26 years. If HPV vaccine does have some effect on fertility, it would take a few years for the birth rate to decline. The low HPV vaccination ratio in "ever been pregnant women" might have been because pregnant women were exempted from HPV vaccination because they were already sexually active. The age at first birth has increased from 24.9 years (2000) to

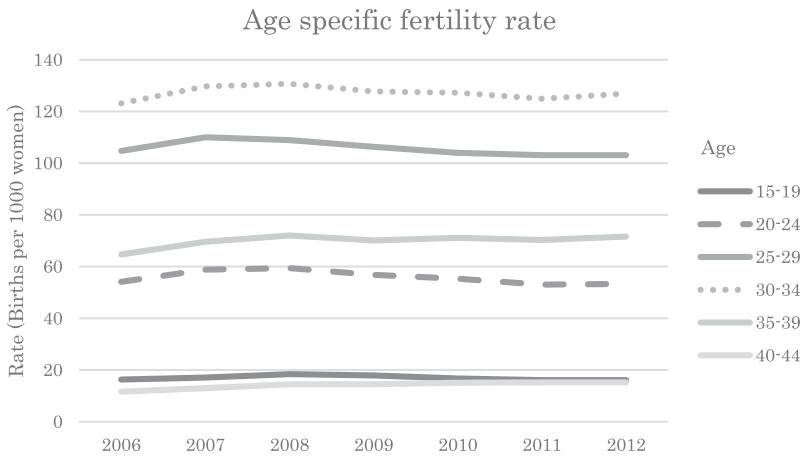

Figure 1. Fertility rate of Australia.
Source: Australian Institute of Family Studies

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Table 1. Fertility rate of high HPV vaccination coverage countries.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Spain	1.38	1.38	1.45	1.38	1.37	1.34	1.32	1.27	1.32	1.33	1.38
Italy	1.37	1.4	1.45	1.45	1.46	1.44	1.43	1.39	1.37	1.35	1.34
UK	1.82	1.86	1.91	1.89	1.92	1.91	1.92	1.83	1.81	1.8	1.79

HPV vaccination introduction year: 2008(Spain, Italy), 2009(UK)
Source: Eurostat. Total fertility rate

26.3 years (2014), with the increased employment rate in women.[4] This could explain the decrease in the fertility of women aged 25–29 years.

Second, if HPV vaccine does have some effect on fertility, the birth rate in other countries should have also changed. For example, Australia, which has the highest HPV vaccination coverage in the world, started the vaccination program with a catch-up program for women aged 12–26 years in 2007; the HPV vaccination rate of women aged 18–26 years was 31%–33% in 2007.[5] Australia's total fertility rate was the highest in 2008 (2.02), and the fertility rate of women aged 15–29 years had unchanged from 2007 to 2008 (Figure 1)[6]. Several countries have HPV vaccination rates of >70%, such as Italy, Spain, and the United Kingdom (UK).[7] HPV vaccination was introduced in 2008 in Spain and Italy, and in 2009 in the UK. The total fertility rates of those countries have been unchanged from 2006 to 2016 (Table 1)[8].

Third, the use of new contraceptive devices for nulliparous women has increased in the United States. Long-acting reversible contraceptives (LARCs) are intrauterine devices and contraceptive implants, which the American College of Obstetricians and Gynecologists are now recommended as first-line contraceptive choices to reduce unintended pregnancy.[9] The use of LARCs had increased eight-fold from 2006 (0.6%) to 2013 (5.0%) in women aged 15–24 years.[10]

In conclusion, on the basis of the above mentioned statistical findings, we argue that the correlation observed between the HPV vaccination introduction and birth rate change in the United States was possibly spurious.

Disclosure of potential conflicts of interest

No potential conflict of interest was reported by the authors.

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