To: Silje S. Skiphamn
From: Gayle DeLong
Re: Fact checking of JTEH article, "A lowered probability of pregnancy in females in the USA aged 25-29 who received a human papillomavirus vaccine injection"
Date: 23 August 2018

Dear Ms. Skiphamn,

Thank you for giving me the opportunity to respond on your fact-check. Since vaccines are administered to healthy people, ensuring that vaccines are safe is paramount. Public confidence in vaccine safety is essential for a viable vaccine program.

To your individual points:

- You have no medical background.

  You are correct that I do not have expertise in healthcare. However, specialists from outside a field can often provide new and valuable perspectives. Often researchers outside a field are able to question assumptions that researchers inside a field accept unquestioningly. A health official who has spent her entire career promoting vaccines might have great difficulty accepting the idea that those vaccines can cause injury (except in very rare cases). To even pose the question of whether vaccines could be associated with lowered fertility might result in professional ostracism. A person outside a field enjoys more intellectual independence.

  Certainly some knowledge of statistics is needed for the analysis I performed. My credentials are as follows: I have a PhD in finance and international business from New York University. The program included graduate-level courses in statistics, econometrics, and stochastic processes. My published works reflect my statistical abilities including the use of tobit analysis (Buch and DeLong 2004), univariate and multivariate analysis (e.g. Amihud et al. 2002) and Oaxaca Decomposition (DeLong 2018a).

- You have picked your data to get the result you desire (e.g. if you had included older women, your result would be different).

  As I explain on page 4 of the paper, the study seeks to compare women who received the HPV shot with those who did not. The passage explains why matching the average ages of the women in the two groups is extremely important. Most of the women offered the vaccine were relatively young. Comparing younger, vaccinated women with older,

unvaccinated women could lead to erroneous results: the younger women could have been less likely to ever have been pregnant because of the vaccine or because of age. Therefore, the study focused on women aged 25 to 29, with the average age in each group being 27.0 years. (See Table 2 of the paper (DeLong 2018b).)

- You can´t use a cross-sectional study to draw conclusions about cause effect.

  You are correct that a cross-sectional study cannot determine cause and effect. I never claim in the paper that the HPV vaccine ***causes*** lowered fertility. However, the statistics in this paper show that women aged 25 to 29 who received the HPV vaccine were less likely to have ever been pregnant. Perhaps women who received the HPV vaccine engage in activities that limit child-bearing – and we should certainly investigate what those activities could be – but the fact remains the data show an ***association*** between HPV vaccine uptake and lowered fertility.

- In your analysis you didn´t include data about use of birth control and time of vaccination for women who got pregnant.

  You are correct that contraception could be an important potential cofounder. However, the data provided in the database I used in the study – the National Health and Nutrition Examination Survey (NHANES) – are very limited, both in scope and in response rate. NHANES includes data on only three types of contraception: condoms, the birth control pill, and injectables. Methods such as female or male sterilization, IUDs or abstinence are not included. Additionally, the response rate to the questions was limited. Only one in seven women supplied information concerning contraception. Preliminary results of a follow-up study I am doing suggest that married women who received the HPV shot were less likely to be using birth control than married women who did not receive the shot.

  Concerning the timing of vaccination and pregnancy, NHANES provides very limited information. Starting in the 2011-12 survey, women were asked the age at which the HPV vaccine. Since my analysis must end with the 2013-14 survey (the questions concerning pregnancy were moved to a different survey), the question of vaccination age overlaps with only half the data in my study, too short for meaningful analysis.

  Both of these questions should be explored, and I encourage our health officials to do so.

- The birth rate among women over 30 is rising. [I realize you did not ask me to respond to this point, but I would like to offer the following observation.]

You are correct that the birth rate among women over 30 is rising. However, women over the age of 30 were less likely to have received the shot than younger women. Moreover, the rise birth rates in older women does not offset the fall in fertility for younger women. Overall birth rates are falling around the world (Norway: https://www.thelocal.no/20170412/norwegian-birth-rate-decreases-for-seventh-consecutive-year ; United States, Finland, Denmark, Russia and Poland: see the first paragraph of https://info.cmsri.org/the-driven-researcher-blog/vaccine-boom-population-bust).

My paper did not claim to offer a final answer on whether the HPV vaccine influences fertility. It simply raised concerns and called for further investigation. Dismissing studies that we disagree with will only stifles legitimate scientific debate. I encourage health officials to promptly investigate why the statistical relationship exists between the HPV shot and lowered fertility. I stand ready to work with any researcher who is interested in pursuing possible explanations for this finding.

References

Amihud, Y., DeLong, G. and Saunders, A. 2002. The effects of cross-border bank mergers on bank risk and value. *Journal of International Money and Finance* 21: 857-877.

Buch, C.M. and DeLong, G. 2004. Cross-border bank mergers: What lures the rare animal? *Journal of Banking & Finance* 28: 2077-2102.

DeLong, G. 2018a. Is "Delitigation" Associated with a change in product safety? The case of vaccines. *Review of Industrial Organization* 52 (1): 1-54.

DeLong, G. 2018b. A lowered probability of pregnancy in females in the USA aged 25-29 who received a human papillomavirus vaccine injection. *Journal of Toxicology and Environmental Health, Part A* 81 (14): 661-674. doi:10.1080/15287394.2018.1477640.