

# Gender (in)equality in Human Papilloma Virus (HPV) vaccinations and treatment

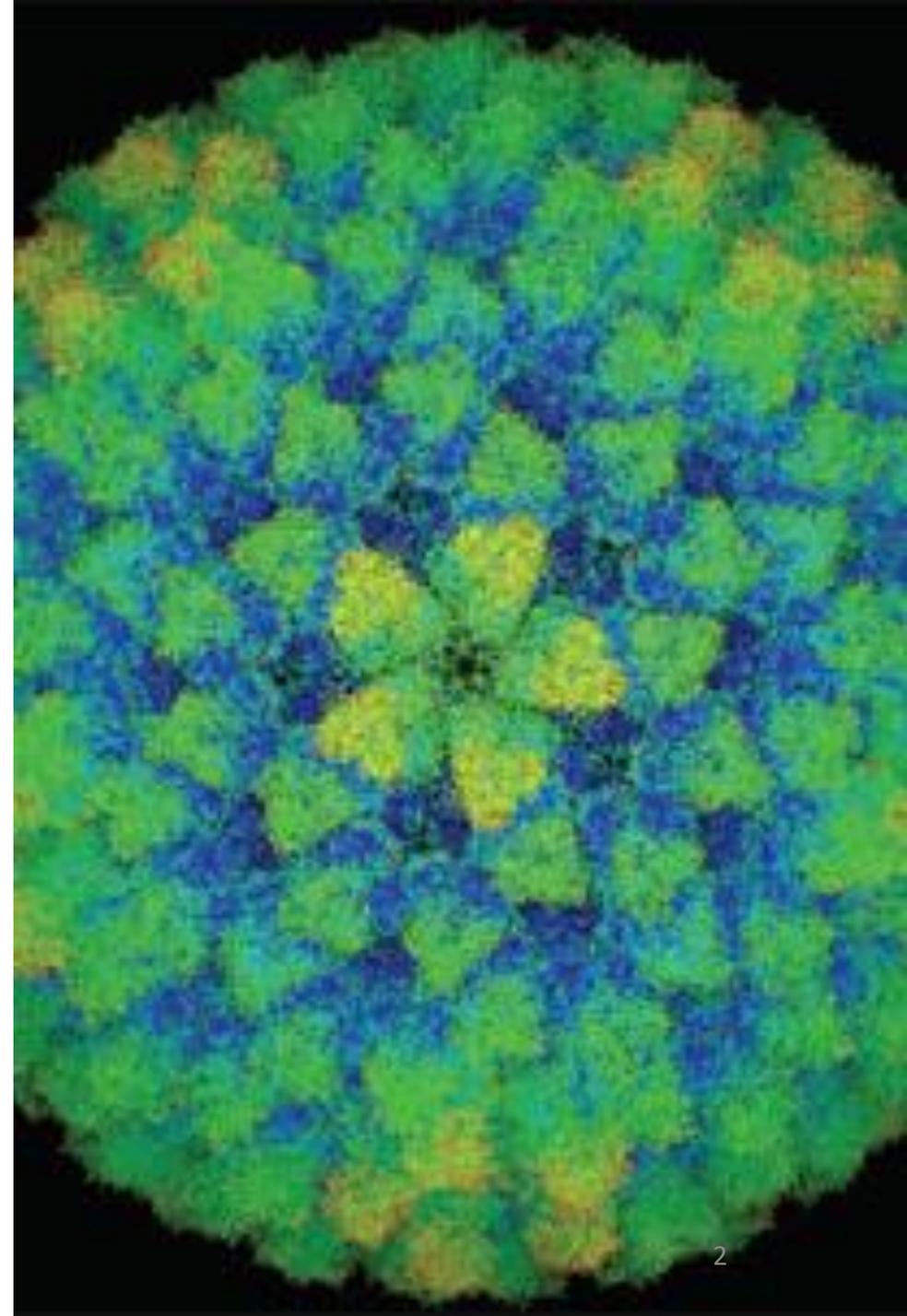
Prof. Giampiero Favato

Institute of Leadership and Management in Health (ILMH)  
Kingston University London



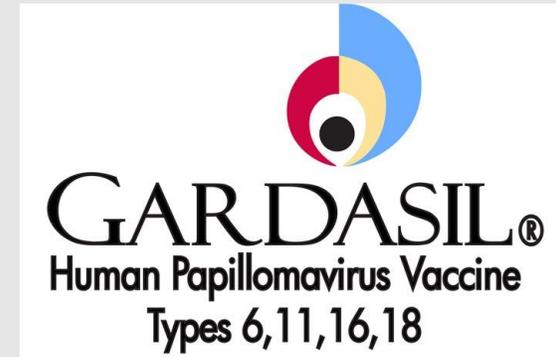
# HPV virus: a gender neutral killer

- Four out of five (80%) of the world's population will contract some type of the virus once in their life via sexual contact [1]
- High risk types of HPV can cause cervical cancer in women as well as other cancers such as anal, mouth/throat and cancer of the penis in men [2]



# HPV infection can be prevented

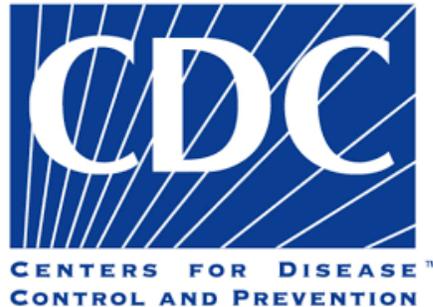
- Individuals who are not sexually active almost never develop genital HPV infections [3]
- HPV vaccination before sexual activity can reduce the risk of infection by the HPV types targeted by the vaccine [4]



# Debate on vaccination strategies

## Gender neutral vaccination

- Physicians recommend to vaccinate girls and boys



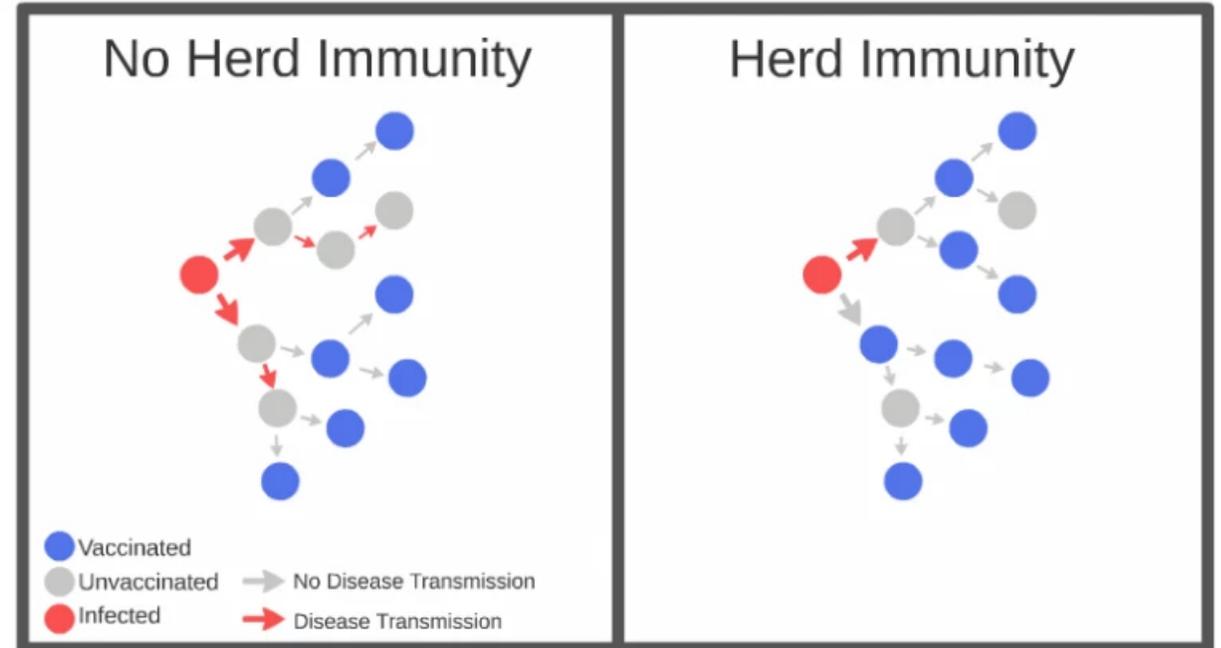
## Selective vaccination

- Most of the National Health Systems in Europe continue to implement the selective immunization of 12-year-old girls only
- This policy decision is based purely on cost-effectiveness

# How are boys protected if they are not vaccinated?

## Herd immunity

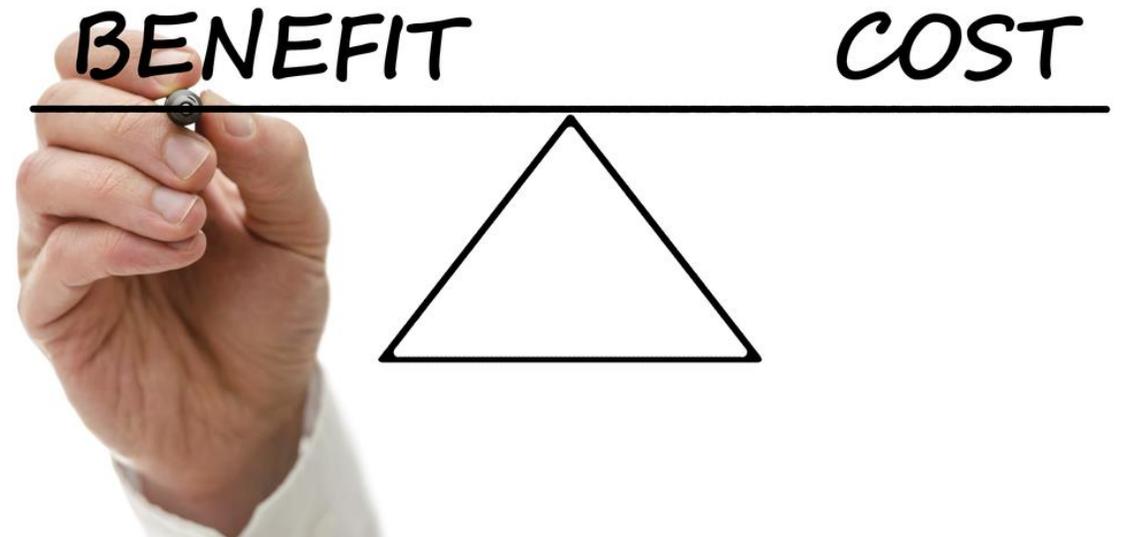
- The presence of enough immune (vaccinated) individuals in a community interrupts the transmission of an infective agent, thereby providing indirect protection to unvaccinated (susceptible) persons [5].



# Our research: critical review of cost effectiveness studies (n=8)

## What is cost-effectiveness?

- Form of economic analysis that compares the relative costs and outcomes (effects) of different interventions.
- If the incremental cost of a new intervention results below a given threshold, then it is cost-effective.



# Outcome 1: a matter of price

## Sensitivity to boundary conditions

- All the cost-effectiveness studies resulted extremely sensitive to the inputs used to inform the models
- In particular, adding boys to HPV vaccination became cost effective in all models at a threshold price/vial

## Threshold price per vaccine vial

€28

at 2015 values

# Outcome 2: ecological validity

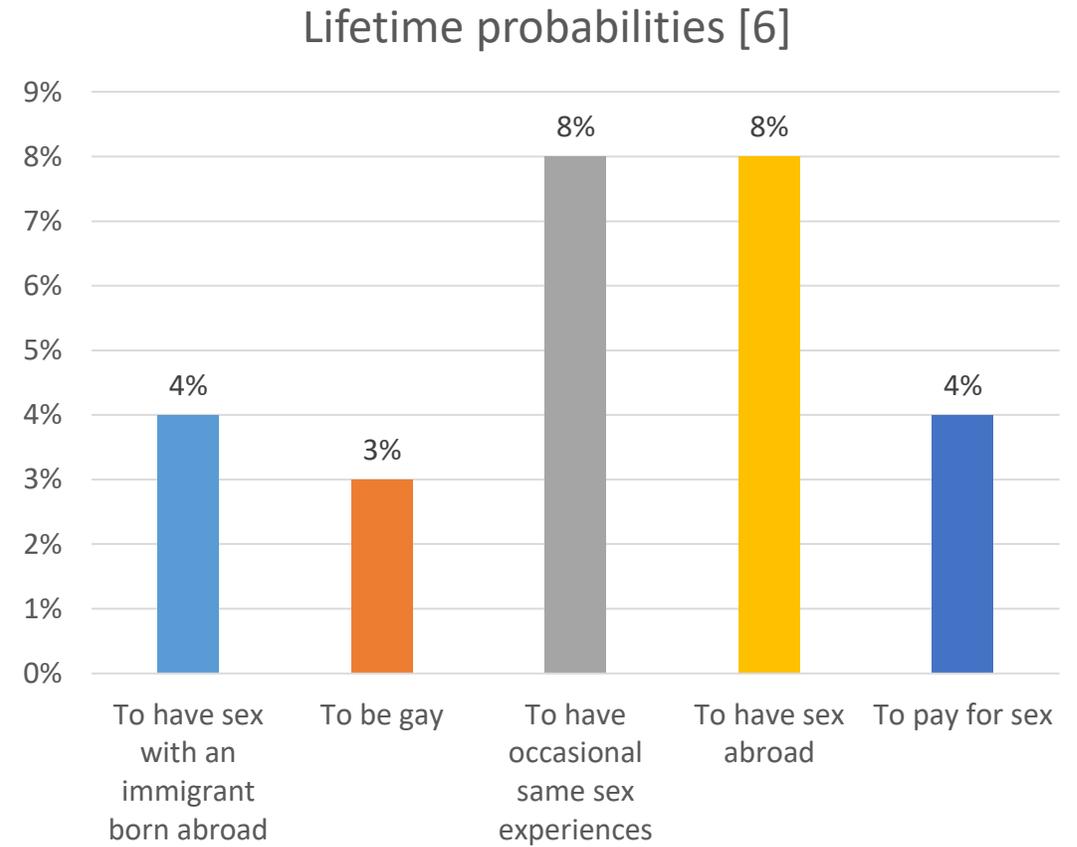
## How well the models reflect our society?

- Closed population or cohort models: no immigration allowed
- Behaviours relevant to sexual mixing [6] ignored:
  - Sexual identity
  - Concurrent partnerships
  - Sex abroad
  - Pay for sex
  - Frequency of unprotected sex

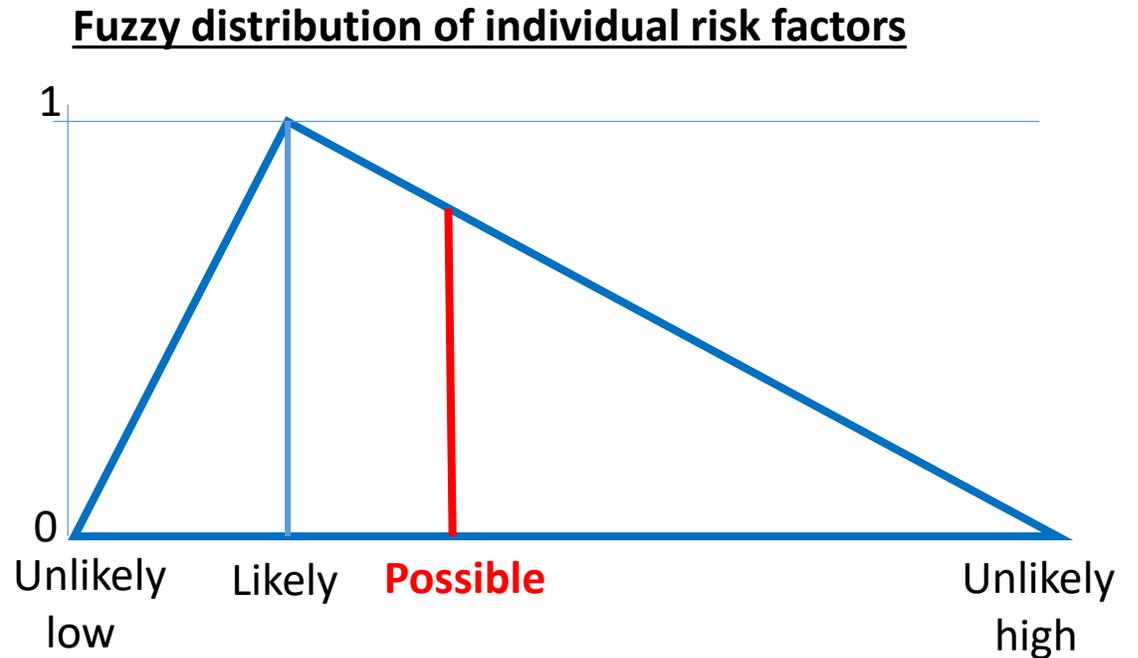
## Implications

- The non-modelled behaviours related to sexual mixing may have produced an over-estimation of the impact of herd immunity [7]
- When we tested a credible hypothesis of 5% to 20% over-estimation of herd immunity, **most of the scenarios including gender neutral vaccination became cost-effective.**

# About a 12 year old boy



In his life, an unvaccinated boy has a 4 to 5 % possibility to be unprotected by herd immunity...



...when it counts the most



MSM



PAY FOR SEX



SEX ABROAD

up to **44x** risk of HPV infection  
vs. general population [8]

# Conclusions

- The published cost effectiveness studies on HPV vaccination to boys are likely to over-estimate the benefits of herd effects on the unvaccinated population
- A relatively small (15 to 20%) over-estimation of herd immunity obtained with selective immunisation could induce a significant error in the estimate of the cost-effectiveness of gender neutral immunisation.

**Offering the HPV vaccination to both boys and girls would be the most effective option for improving public health.**

[Research Council UK, 2013]



# References

- [1] Koutsky L Epidemiology of genital human papillomavirus infection. *The American Journal of Medicine* 1997; 102 (5A), 3–8.
- [2] Giuliano AR et al. Epidemiology of human papillomavirus infection in men, cancers other than cervical and benign conditions. *Vaccine* 2008; 26 (10), K17–K28.
- [3] Schiller JT, Castellsague X, Garland SM. A review of clinical trials of human papillomavirus prophylactic vaccines. *Vaccine* 2012; 30 Suppl 5:F123-138.
- [4] Koutsky LA, Ault KA, Wheeler CM, et al. A controlled trial of a human papillomavirus type 16 vaccine. *New England Journal of Medicine* 2002; 347(21):1645-1651.
- [5] Fine, P.; Eames, K.; Heymann, D. L. Herd immunity: a rough guide. *Clinical Infectious Diseases* 2011; 52 (7): 911–6
- [6] Johnson AM, Mercer CH, Beddows S et al. Epidemiology of, and behavioural risk factors for, sexually transmitted human papillomavirus infection in men and women in Britain. Natsal-2. *Sex Transm Infect* 2012; 88(3):212-7.
- [7] Burger EA, Sy S, Nygård M, Kristiansen IS, Kim JJ. Prevention of HPV-related cancers in Norway: Cost-effectiveness of expanding the HPV vaccination program to include pre-adolescent boys. *PLoS ONE* 2014; 9(3): e89974.
- [8] Goldstone S et al. Prevalence of and Risk Factors for Human Papillomavirus (HPV) Infection Among HIV-Seronegative Men Who Have Sex With Men. *Journal of infectious Diseases* 2011; 203: 66-74.