

*Use of real-world data for HPV vaccine trial follow-up  
in the Nordic region*

*and*

*Real world effectiveness of HPV vaccination*

*against cervical cancer and non-cervical anogenital high-grade lesions and cancer in women*

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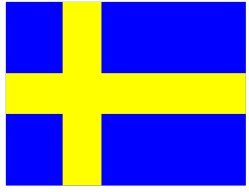
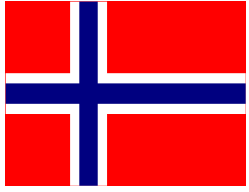
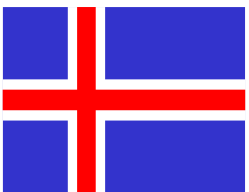
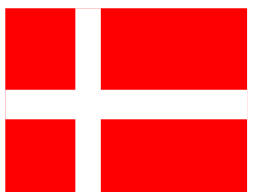
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## Disclosures

*Has received research grant through my institution from Merck*

**Long-term follow-up** study of women who received 4vHPV at enrollment in

the clinical trial (FUTURE 2) in the Nordic countries (n ~ 2,700)



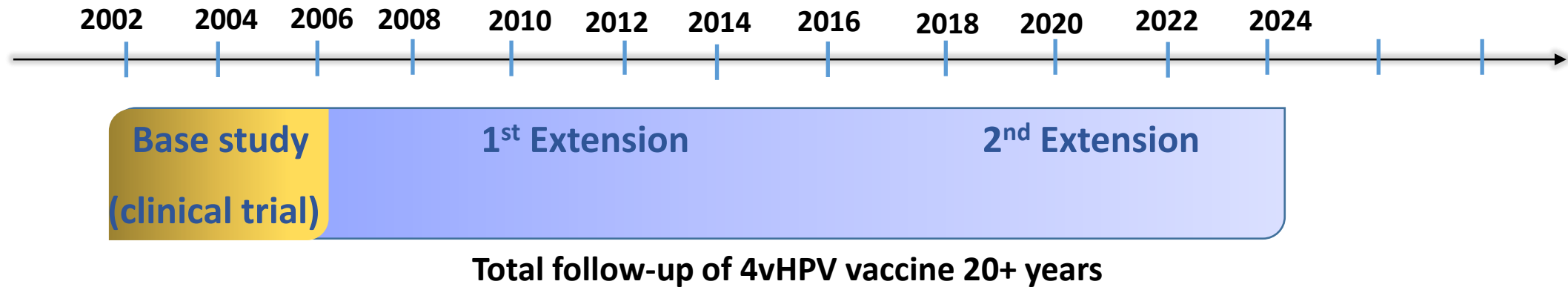
# Optimal conditions for follow-up studies in the Nordic countries

All citizens have a unique personal identification number  
- used universally in society



Population-based surveillance is possible – based on individual-level data  
and with virtually no loss to follow-up

# Long-term follow-up studies in the Nordic countries of the 4vHPV vaccine



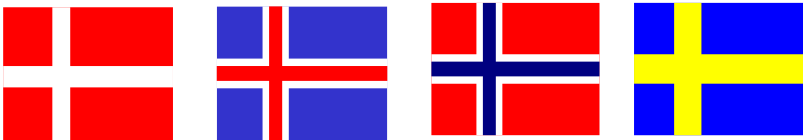
## Unique features of the Nordic follow-up studies

- ✓ Existence of unique personal identifiers
- ✓ Organized cervical cancer screening programs in the Nordic countries
- ✓ Universal registration (collection of Pap test results, biopsy and definitive therapy results) and existence of tissue banks
- ✓ Results organized by unique personal identifiers
- ✓ Legislation allows these registry data to be used for research

# Clinical trial data

## FUTURE 2

~ 2700 women who received Gardasil at enrollment in the clinical study



Estimated long-term effectiveness

# Incidence of HPV 16/18 CIN2 + in the 4vHPV vaccine study - based on 14 years of follow-up

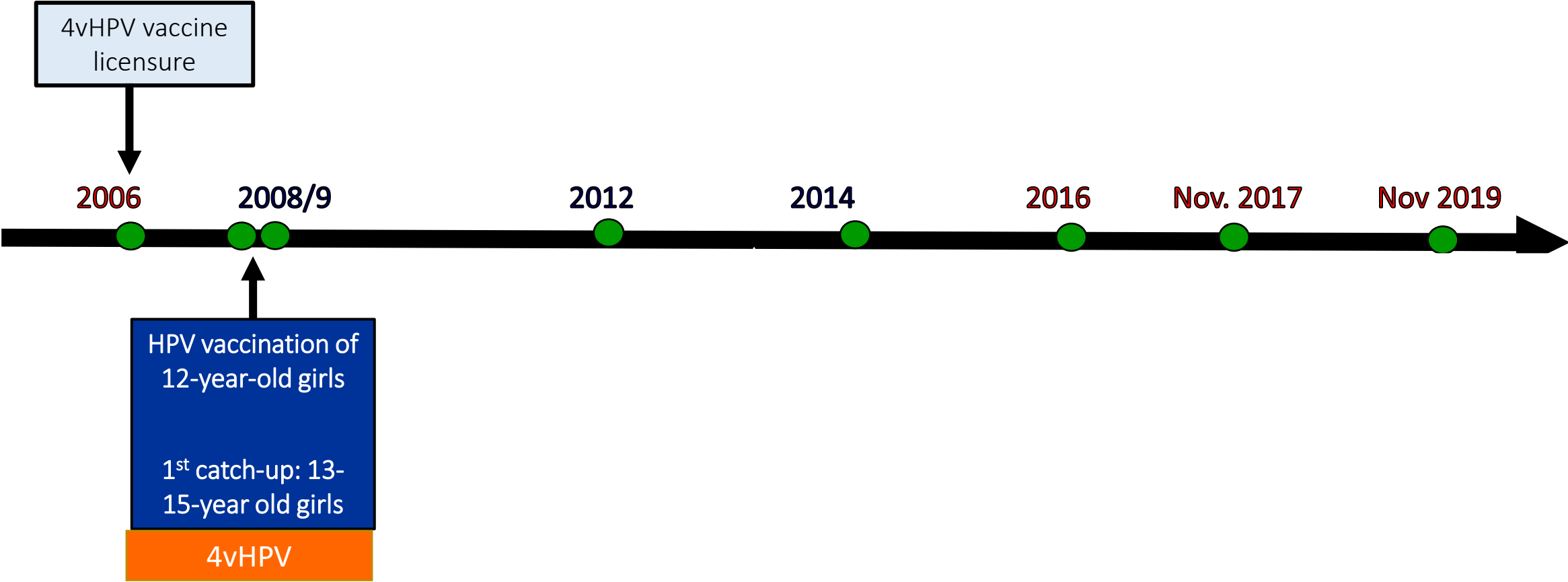
Endpoint	n	Number of outcomes	Person Years at Risk	Incidence Rate per 100 Person-Years at Risk	Vaccine Effectiveness <sup>†</sup> (%)
<b>HPV 16/18-Related CIN 2 or Worse</b>	2084	0	13,794.9	0.0	<b>100</b>
<b>By time since 1<sup>st</sup> vaccination</b>					
< 4 years	1930	0	803.5	0.0	
>4-6 years	2083	0	4119.9	0.0	
>6-8 years	2037	0	3978.7	0.0	
>8-10 years	1914	0	3393.1	0.0	
>10-12 years	1333	0	1479.0	0.0	
>12-14 years	124	0	20.6	0.0	
<b>By Lesion Type</b>					
CIN 2	2084	0	13,794.9	0.0	
CIN 3 or Worse	2084	0	13,794.9	0.0	
CIN 3	2084	0	13,794.9	0.0	
AIS	2084	0	13,794.9	0.0	
Cervical Cancer	2084	0	13,794.9	0.0	
<sup>†</sup> Vaccine effectiveness measures the relative reduction of the disease incidence in vaccine recipients compared to the baseline incidence rate of 0.0287 per 100 person-years established from the incidence rate in an unvaccinated cohort and under the assumption vaccine efficacy is 90%.					

# **Register-based data in relation to the assessment of real world population effectiveness**

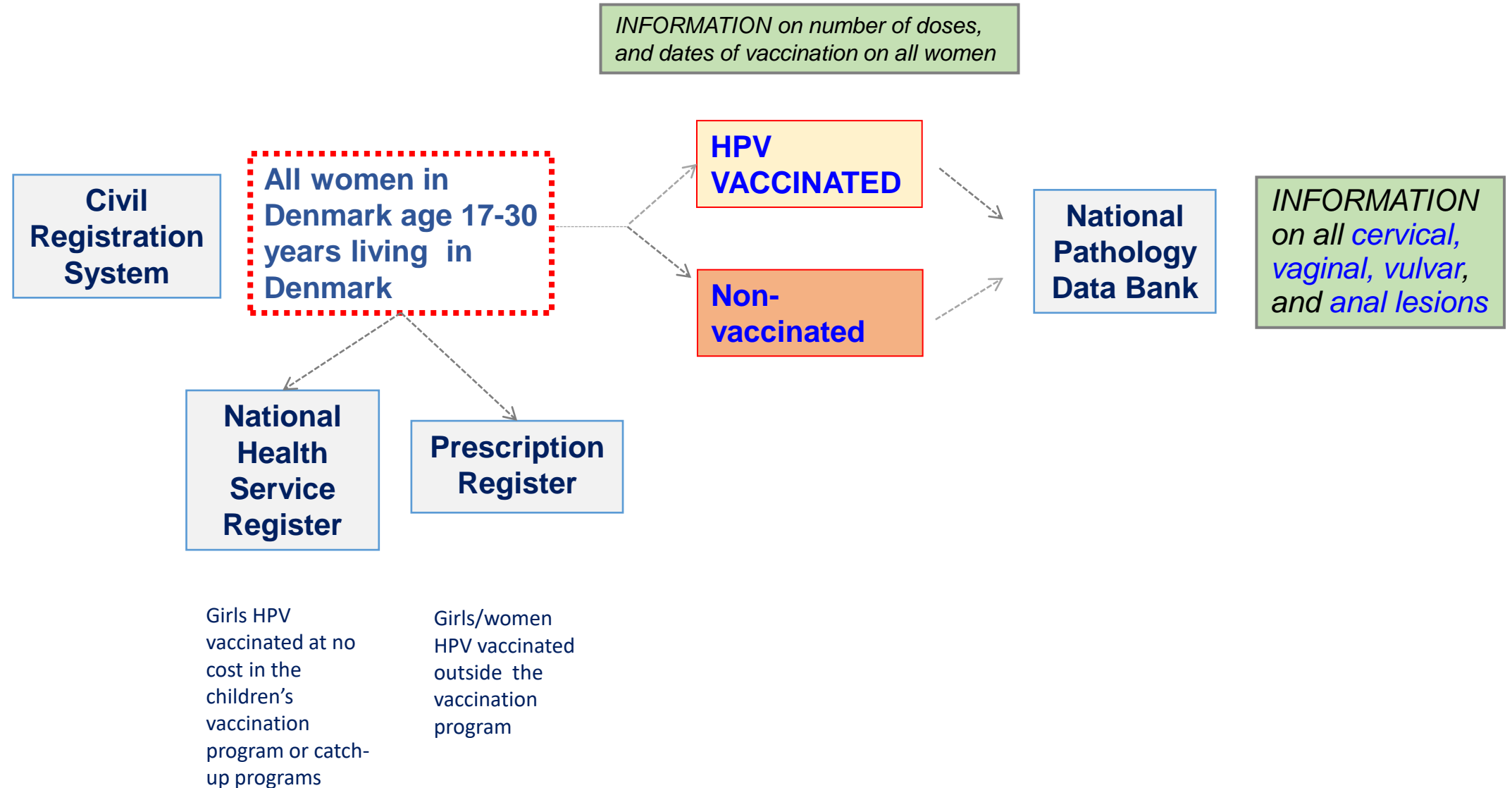


# HPV vaccination in Denmark

## Clinic-based vaccination program



# Information on HPV vaccination and different outcomes



# Effectiveness ..... Cervical cancer

	Person-years	No. of events	IRR (adjust.)	(95% CI)	
<u>Unvaccinated</u>	2,884,778	325	1.0		
<u>Vaccinated</u>					<b>Risk reduction</b>
at age ≤ 16 years	1,643,967	6	0.14	(0.04–0.40)	→ <b>87%</b>
at age 17–19 years	174,679	5	0.29	(0.08–1.01)	→ <b>71%</b>
at age 20–30 years	841,231	168	1.15	(0.88–1.50)	



Studies stratified by outcome	Country	Adjusted risk ratios stratified by age at vaccination	
		<17 years	17–19 years
<b>Cervical cancer</b>			
Lei et al, 2020	Sweden	<b>0.12</b> (0.00–0.34)	—
Kjaer et al, 2021	Denmark	<b>0.14</b> (0.04–0.40)	<b>0.29</b> (0.08–1.01)
Falcaro et al, 2021	England	<b>0.66</b> (0.59–0.75) <sup>a</sup>	—

<sup>a</sup> Estimate for girls vaccinated 12–13 years of age; <sup>b</sup> 17–30; <sup>c</sup> 20–30; <sup>d</sup> 17–26; <sup>e</sup> 17–32

**Real world data can be used to perform  
longterm follow-up of HPV vaccination  
trials**

**Register-based effectiveness studies can  
provide evidence for population-based real  
world impact**

**Thank you for the attention**