

The effects of H1N1 pandemic monovalent vaccine on an influenza outbreak in a prison, Thailand, 2010

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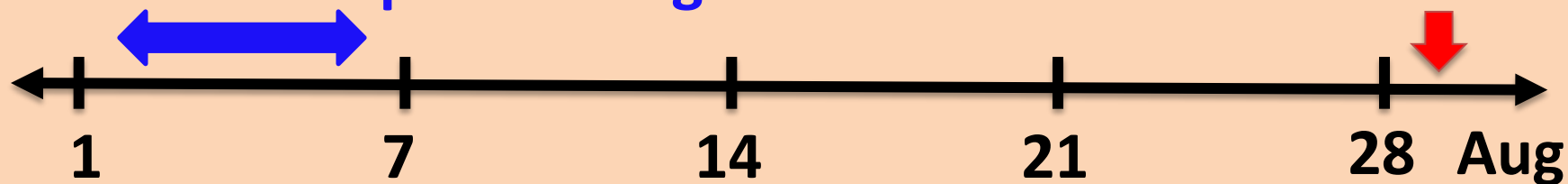
Background of Prison N

- On Aug 29, 2010, the 2009 H1N1 influenza outbreak in male prisoners was detected
- Early August, approximately 1/2 of female & 1/3 of male prisoners received 2009 H1N1 monovalent vaccine



Vaccination period: Aug 2-6

Outbreak detected



2009 H1N1 monovalent vaccine in Thailand

- 2 million doses purchased and distributed in early 2010
- Vaccination target groups:
 - Front-line HCWs
 - Pregnant women
 - Obese population
 - Handicapped
 - Chronic diseases
- H1N1 monovalent vaccine effectiveness studies
 - 72% in England & Scotland (Hardelid P, et al.)
 - 87.3% in Beijing (Wu J., et al.)



Panenza: A/California/7/2009 (H1N1) - like strain NYMC X – 179A

Objectives

- To confirm diagnosis and determine the extent of outbreak
- To identify risk factors of infections
- To evaluate vaccine effectiveness among male prisoners

Methods

Descriptive study

- Reviewed log book, lab reports, antiviral treatment and vaccine records in the prison
- Active case finding in male and female prisoners
- Case definition:
 - Influenza-like illness (ILI): A prisoner who had cough or sore throat AND fever $\geq 37.8^{\circ}\text{C}$ between Aug 20 and Sep 8, 2010
 - Confirmed 2009 H1N1 influenza case: A prisoner who had
 - throat swab positive for 2009 H1N1 influenza by RT-PCR *or*
 - ≥ 4 -fold rise of antibody titer by Hemagglutination Inhibition (HI) test

Analytic study: Retrospective cohort #1

- To identify possible risk/protective factors

2,482 Male prisoners in 5 wards



Wards with a high attack rate

933 Male prisoners from wards 2 and 4

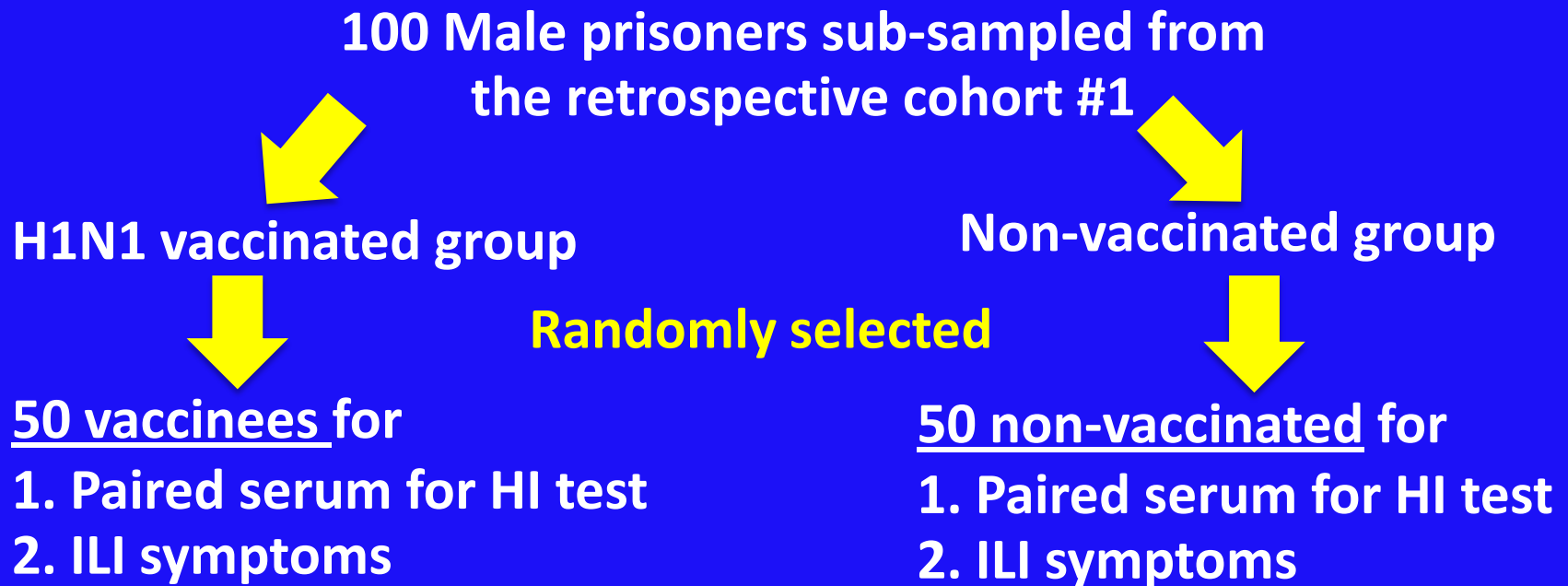


688 (73.7%) Interviewed by a structured questionnaire

- **Statistical analysis:**
 - Crude analysis: Risk ratio with 95% confidence interval
 - Multiple logistic regression: Adjusted OR with 95%CI

Analytic study: Retrospective cohort #2

- To study vaccine effectiveness (using HI test)



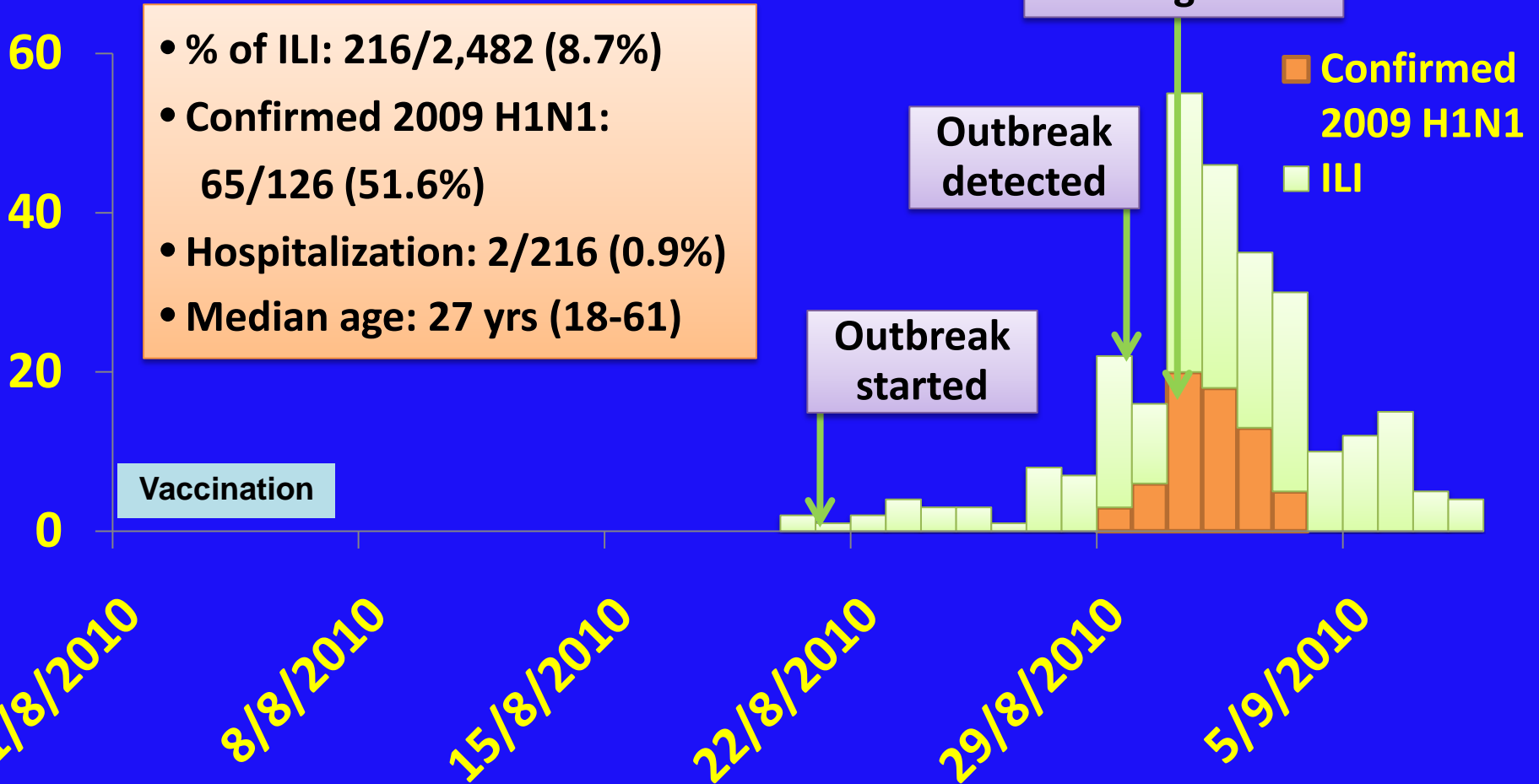
- Paired serum ≥ 4 -fold rise \rightarrow 2009 H1N1 influenza infection
- Statistical analysis: Risk ratio (RR) with 95% CI

$$\text{Vaccine effectiveness} = (1 - \text{RR}) \times 100$$

Result: descriptive study

Number of ILI and confirmed 2009 H1N1 cases in male prisoners (N=216), prison N, Aug 20-Sep 8, 2010

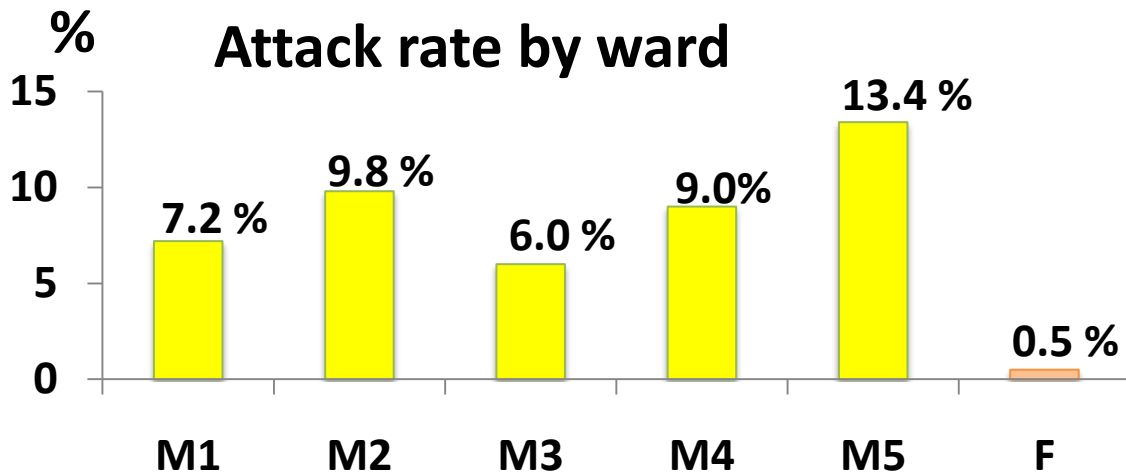
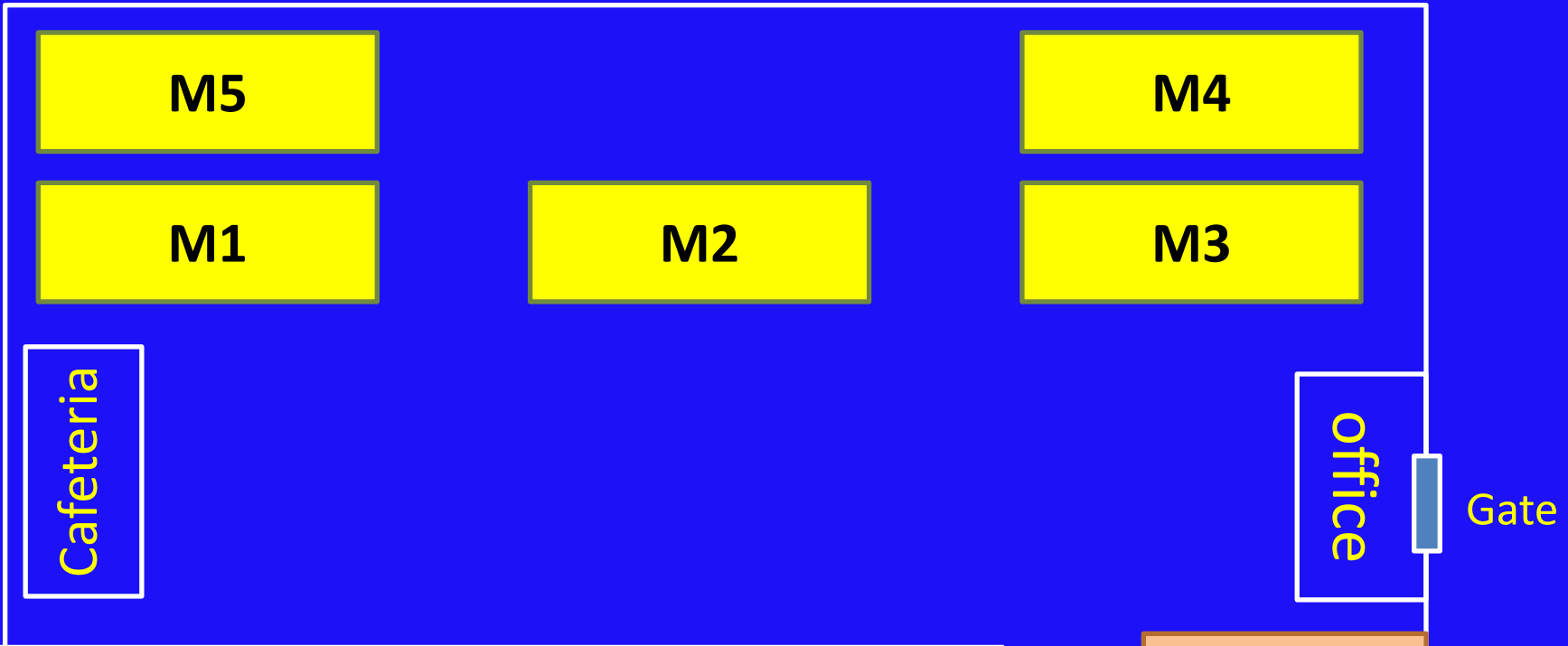
Number of cases



Note: Data from treatment unit

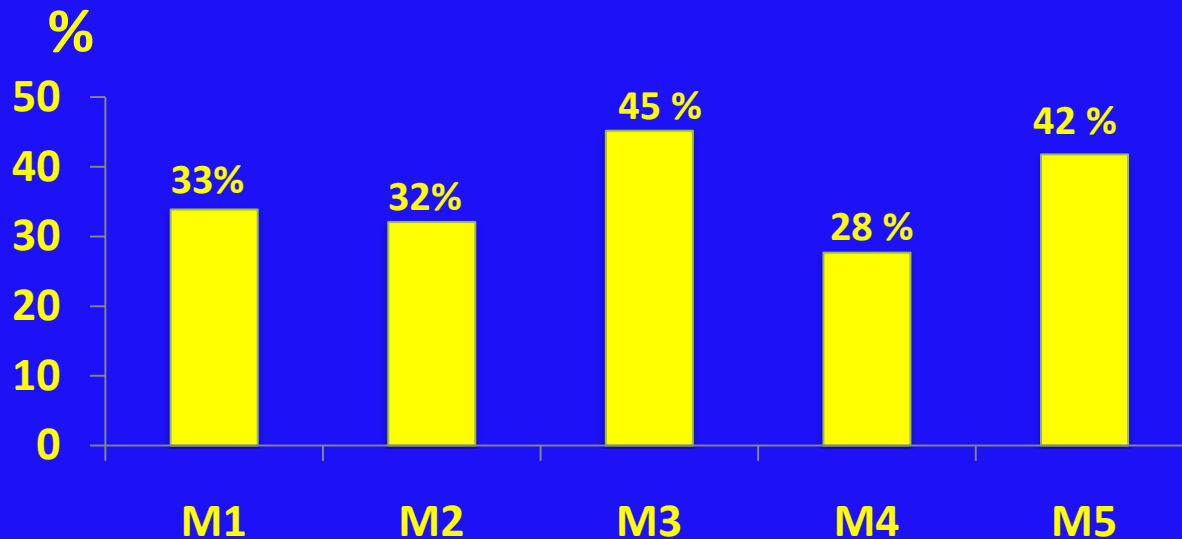
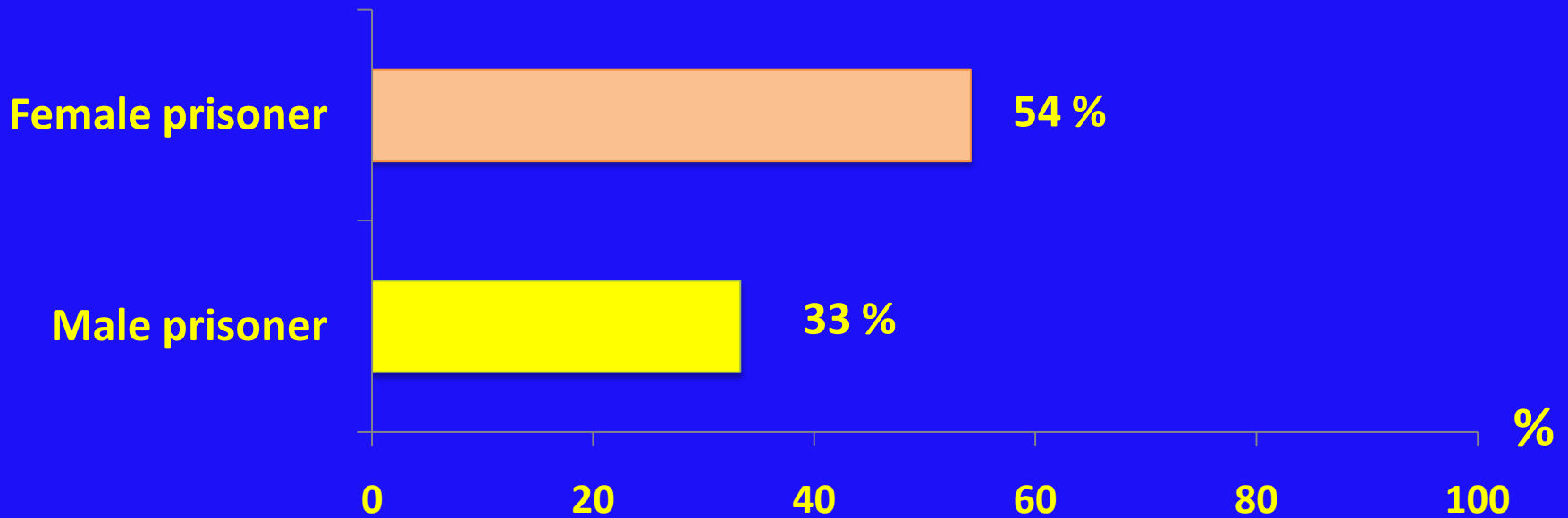
Date of diagnosis

Map of prisoner wards and attack rates



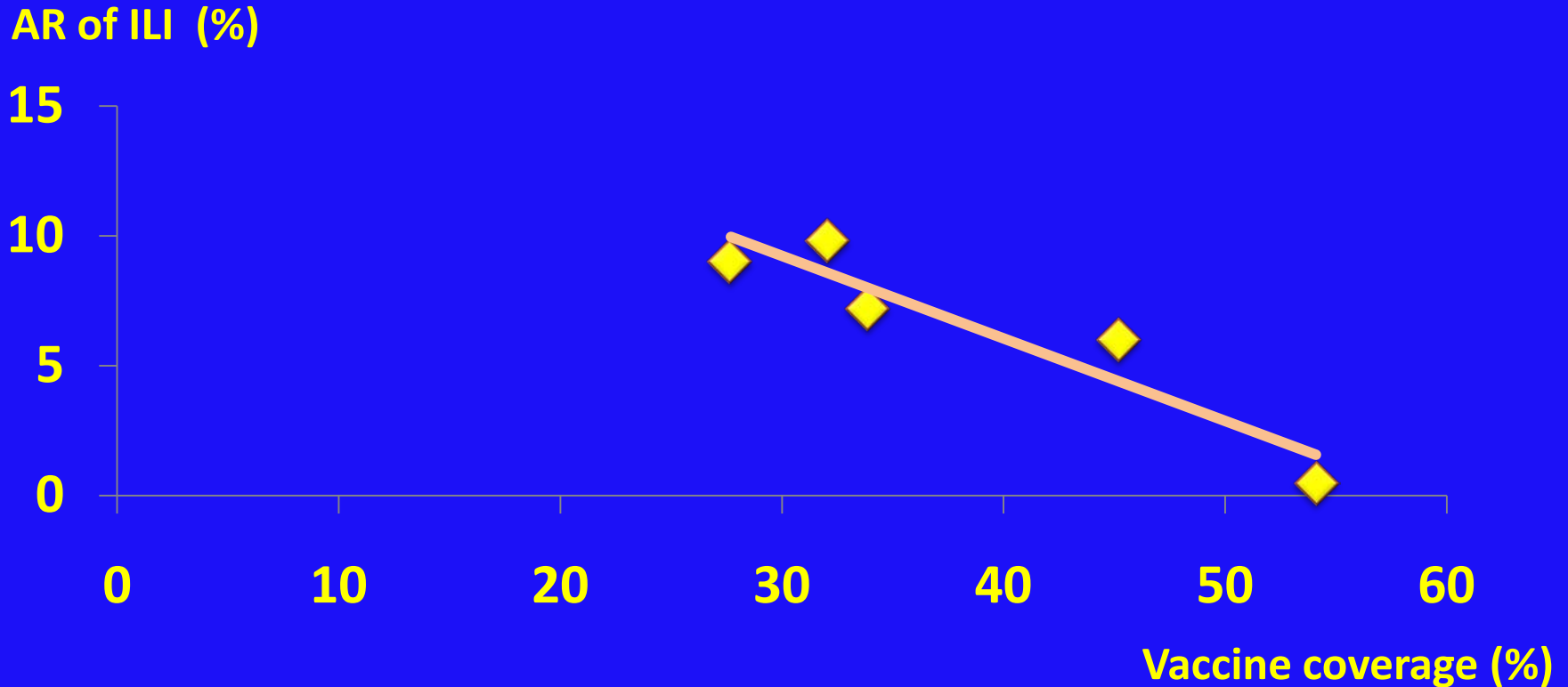
- M** Prison for male
- F** Prison for female

2009 H1N1 monovalent vaccine coverage (Vaccines administered during Aug 2 - 6, 2010)



Coverage of 2009
H1N1 monovalent
vaccine by male ward

Correlation between H1N1 influenza vaccine coverage and ward-specific attack rate of ILI



Correlation coefficient = **-0.93 (p=0.02)**

Result: Analytic study

Multivariate analysis: Retrospective cohort #1 (N=688)

Factor	Crude RR	95% CI	Adjusted OR	95% CI
Received 2009 H1N1 vaccine	0.52	0.27-0.98	0.51	0.26-1.02
Age group				
< 25 years	1.49	0.67-3.31	1.42	0.59-3.42
25-39 years	1.15	0.55-2.43	1.11	0.49-2.49
≥ 40 years	1	Ref	1	Ref
Exposed to ARI persons	1.61	0.98-2.63	1.56	0.90-2.71
Sharing spoon	2.05	1.19-3.53	1.42	1.06-1.92

Retrospective cohort #2 for H1N1 vaccine effectiveness study

2009 H1N1 vaccinated (n=50)

Non-vaccinated (n=50)

Paired serum tested (n=49)

Loss to follow up (n=1)

Paired serum tested (n=47)

Loss to follow up (n=3)

4-fold rise
Yes: 6
No: 43

4-fold rise
Yes: 29
No: 18

12.2%

61.7%

Effectiveness of H1N1 monovalent vaccine

		H1N1 Infection (4-fold rise)*		ILI symptoms*	
		Yes	No	Yes	No
2009 H1N1 vaccination	Yes	6	43	4	45
	No	29	18	7	40
Relative risk (95% CI)		0.20 (0.09, 0.43)		0.55 (0.17, 1.75)	

Vaccine effectiveness (preventing infection) = 80% (57%, 91%)

Vaccine effectiveness (preventing ILI) = 45% (-75%, 83%)

***from 96 male prisoners who had paired serum**

Discussion

Lower attack rates in female than male wards

- Incidence of 2009 H1N1 influenza was higher in male prisoners than female prisoners:
 - Delay in case detection and inadequate control measures in males
 - Higher coverage of H1N1 monovalent vaccine in females than males (54% vs. 33%)
 - Better personal hygiene in female prisoners

Effects of the 2009 H1N1 monovalent vaccine

- 33% of vaccine coverage might not be enough for preventing H1N1 epidemic in a prison setting
- Vaccine contributed to lower attack rate (8.7%) compared to other 4 prison outbreaks in Thailand (ILI attack rates: 10.3-26.6%)
- 54% vaccine coverage in female ward might be a factor of limited transmissions of H1N1 virus in female prisoners → reach a herd immunity level

Limitations

- Non-participation bias
(73.7% participated)
- Information bias of outcome variable:
 - Some prisoners did not give information on their illness, e.g., respiratory symptoms
 - Prisoners in the vaccinated group may be less likely to report symptoms and prisoners in the nonvaccinated group may be more likely to report symptoms

Conclusions

- The 2009 H1N1 influenza outbreak in Prison N mainly affected male prisoners
- The 2009 H1N1 monovalent vaccine was less than 50% effective in preventing ILI symptoms in this outbreak
- The vaccines could significantly reduce 2009 H1N1 infection (80%) and resulted in limited transmission and low ILI attack rate among prisoners

Public health implications

- Advocate influenza vaccination policy to prison management
- At least 50% of vaccine coverage is needed for preventing an outbreak in a prison setting
- Further study the immunogenicity of the H1N1 monovalent vaccine sold in Thailand
- Promote personal hygiene practice and provide adequate eating utensils to all prisoners

Acknowledgements

- Director, officers and prisoners in Prison N
- District Health Office, Mueang, Nakhonsawan
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