

Risk Factors for Transmission of Hand, Foot and Mouth Disease in the Daycare Setting: Zhejiang Province, 2010

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Class of 2009



Epidemic of hand, foot, mouth disease (HFMD) in China during 2008-2010

	# reported
HFMD patients	3,400,000
Severe HFMD*	43,000
Deaths	1,400
Outbreaks	543[#]

*** Brain stem encephalitis and pulmonary failure caused by HEV71**

82% occurred in daycare setting

Most of reported HFMD patients and deaths occurred in young children

	Age < 5y	Age ≥ 5y
HFMD patients	93%	7%
Deaths	98%	2%

- **Most Chinese families have one child**
- **Both parents work**
- **Grandparents take care of child until 2 years old**
- **Most of children aged 2-5 years attend daycare before primary school**
- **A typical daycare center has 10-30 classrooms**

Main control measure currently is closing daycare centers

- **Disruptive**
- **Unevaluated**
 - **Case-control study showed:**
 - **OR daycare attendance = 2.1**
 - **OR community contact = 7.3**
- **Alternatives to daycare closure needed**

Objectives

- **To identify modifiable risk factors for HFMD transmission in daycare**
- **To provide evidence for development of prevention and control measures**

HFMD: Fever and rash on hand, foot, mouth or buttock



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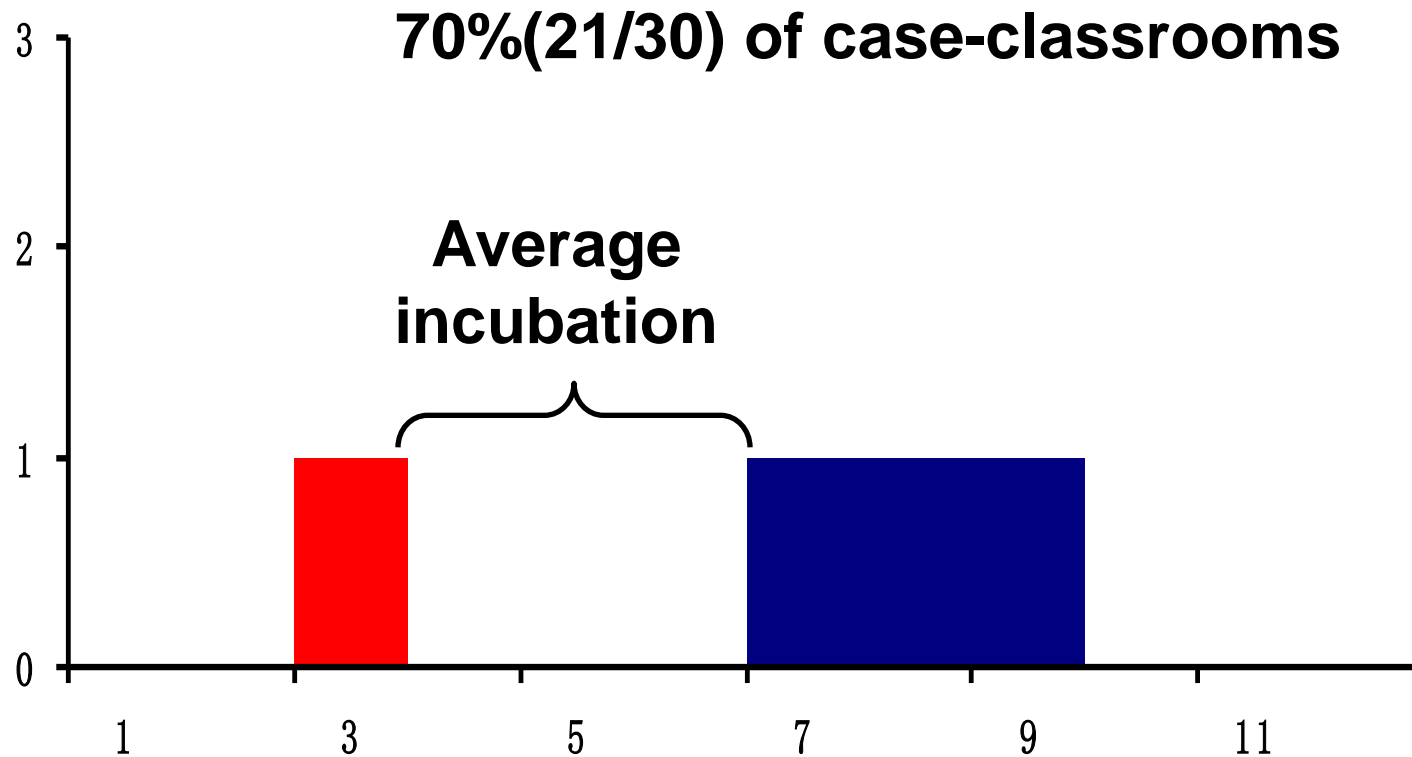
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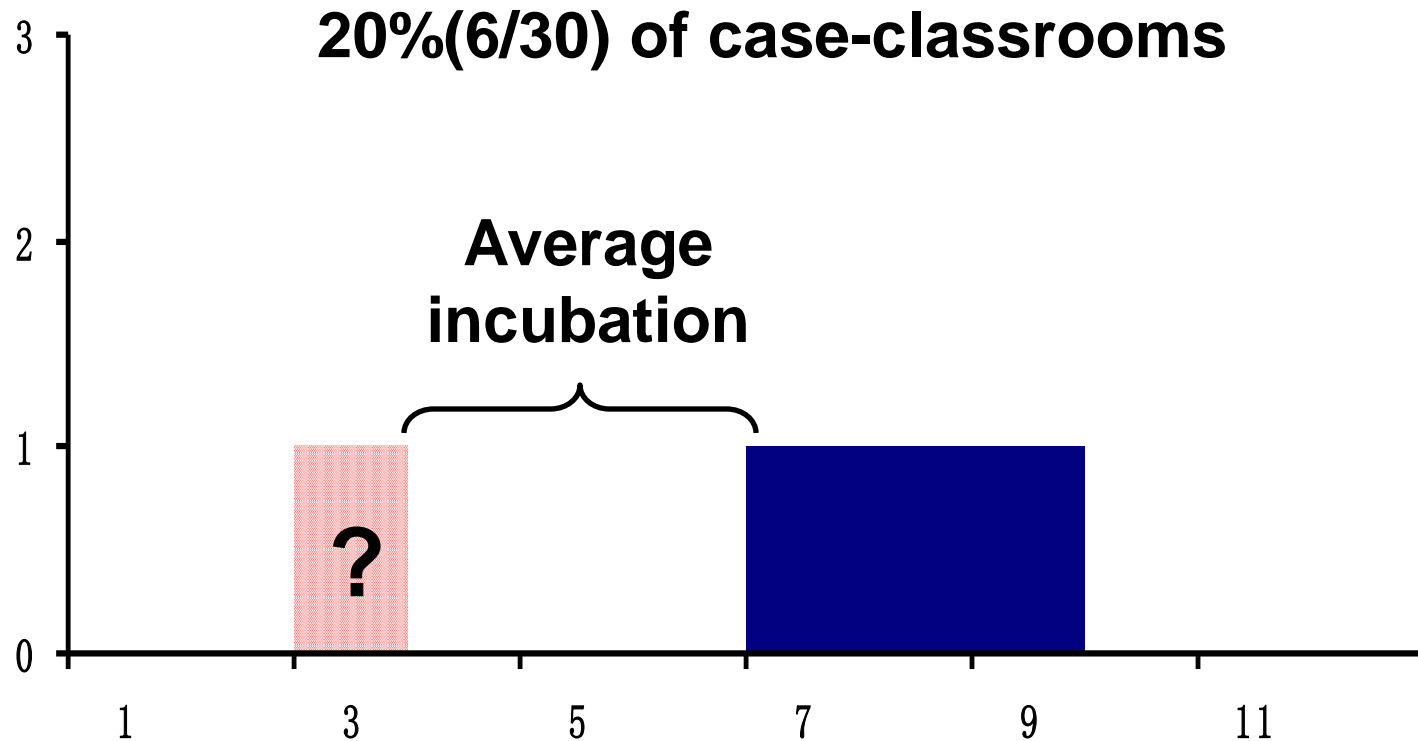
Case-control investigation

- **1:2 frequency matched case-control investigation**
- **Cases and controls were daycare classrooms**

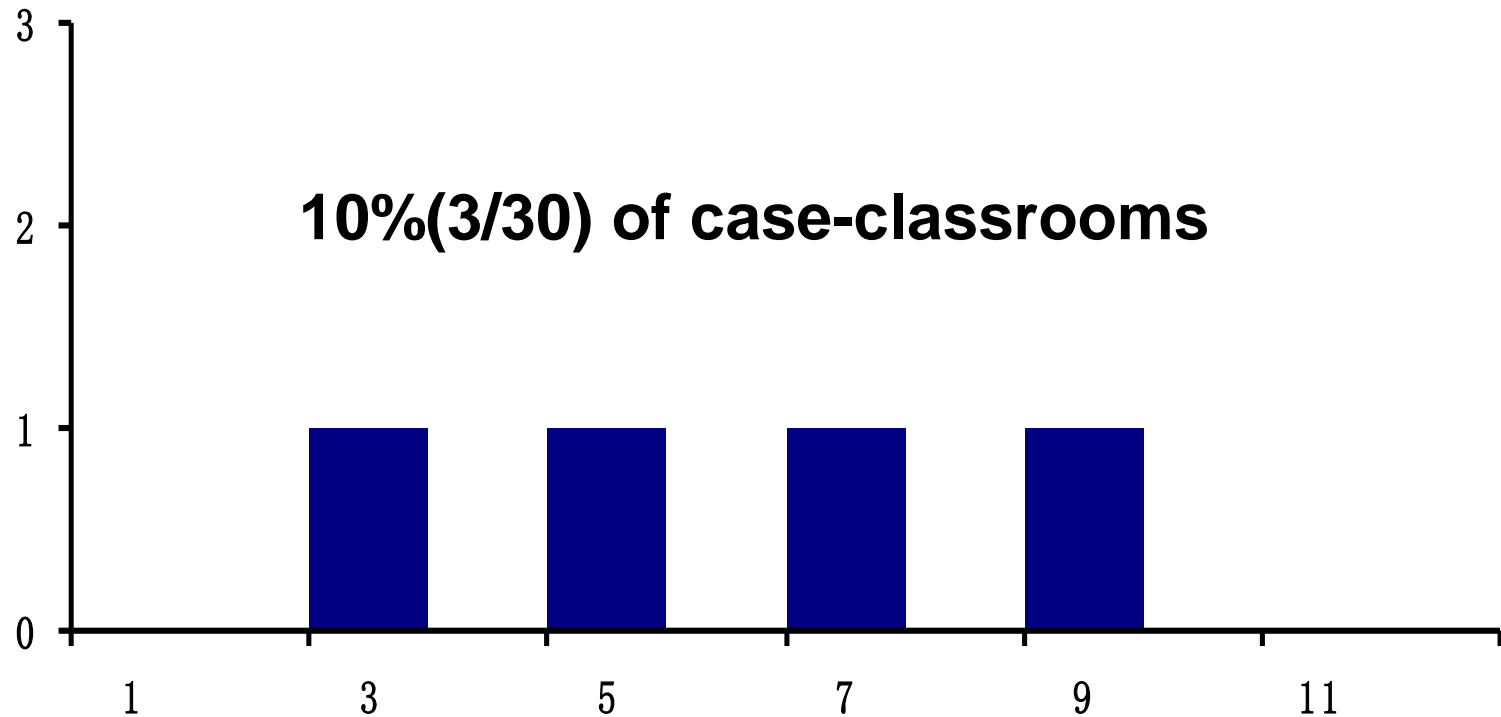
Case-classroom: ≥ 2 reported patients in any given 3 days during May 1-June 30, 2010



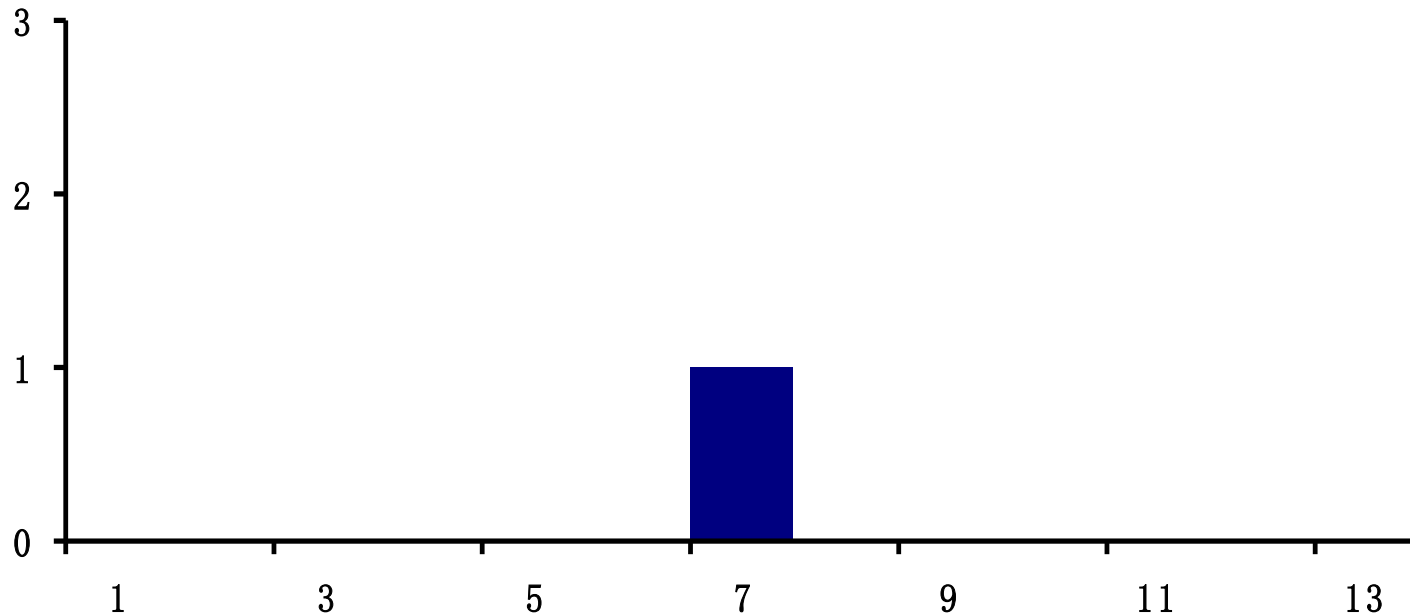
Case-classroom: ≥ 2 reported patients in any given 3 days during May 1-June 30, 2010



Case-classroom: ≥ 2 reported patients in any given 3 days during May 1-June 30, 2010



Control-classroom: Just one HFMD patient in any 7-day period



Schematic Figure

32 exposure factors gathered by direct observation and face-to-face interview of daycare teachers

Categories	# factors
Layout of classroom and nap room	12
Crowding (m ² /child)	1
Hand hygiene equipment and habit	7
Other personal hygiene	9
Morning check and case isolation	3

Attack rate in case-classrooms was higher than in control-classrooms

Group	# classrooms	# cases	# children	AR(%)	AR range (%)	P
Case	30*	80	853	9.4	4.0-29	<0.001
Control	47**	47	1472	3.3	1.9-10	

* 30 classrooms met case definition, 100% participated

** 60 classrooms randomly selected from 390 eligible control classrooms; 47 (78%) participated

17% of case-classrooms had no direct sunlight compared with 0% of control-classrooms

Direct sunlight	# Exposed		% Exposed		OR	95% CI*
	Case (n=30)	Control (n=47)	Case	Control		
No	5	0	17	0	∞	1.6- ∞
Yes	25	47	83	100	Ref	

* Fisher's exact CI

20% of case-classrooms had no soap or other hand sanitizer compared with 0% of control-classrooms

Availability of Hand Sanitizer	# Exposed		% Exposed		OR	95%CI*
	Case (n=30)	Control (n=47)	Case	Control		
No	6	0	20	0	∞	2.1- ∞
Yes	24	47	80	100	Ref	

* Fisher's exact CI

93% of case-classrooms used only plain water* to clean drinking cups compared with 70% of control-classrooms

Only plain water to clean cups	# Exposed		% Exposed		OR	95%CI#
	Case (n=30)	Control (n=47)	Case	Control		
Yes	28	33	93	70	5.9	1.2-57
No	2	14	6.7	30	Ref	

*Other classrooms used detergent with chloridion

Fisher's exact CI

In 13% of case-classrooms, an HFMD-child stayed in classroom >1 day after symptom onset, compared with 0% of control-classrooms

HFMD-child stayed in classroom >1d after symptom onset	# Exposed		% Exposed		OR	95%CI*
	Case (n=30)	Control (n=47)	Case	Control		
Yes	4	0	13	0	∞	1.1- ∞
No	26	47	87	100	Ref	

* Fisher's exact CI

Crowding situation between case- and control-classrooms was not different

	m²/child	95%CI	P
Case-classroom	1.3	1.1-1.4	0.19
Control-classroom	1.5	1.3-1.7	

Limitations

- **# of case- and control-classrooms were small**
 - Limited power to detect all important risk factors
- **“Face saving” bias**
 - Respondents tend to give socially correct answer to look good and to avoid possible punishment
- **Misclassification of asymptomatic infections**
 - Non-differential bias likely: Underestimation of OR

Conclusions

- **Lack of direct sunlight, unavailability of hand sanitizer, no drinking cup disinfection, and lack of timely exclusion of patients were risk factors for HFMD transmission in daycare**
- **These factors have practical implications for HFMD prevention and control**

Recommendations

- **Move children's classrooms to rooms with direct sunlight**
- **Promote hand washing**
- **Disinfect drinking cups**
- **Exclude children with HFMD from classrooms promptly**
- **Conduct trials to compare daycare closure to interventions identified in this study**

Communication of study findings to MOH, China CDC, other public health leaders, and physicians through the *CFETP Dispatch*



中国现场流行病学培训项目

现场报告

Dispatch of the Chinese Field Epidemiology Training Program

2011年第五期（总第十九期）

2011年3月15日发行

<http://211.167.248.12/cfetp>

本期焦点:

幼托机构手足口病传播的相关因素

主要发现：本研究采用病例对照研究的方法，比较出现手足口病传播的班级（“病例班级”）和未出现传播的班级（“对照班级”）在相关因素上的差异。结果表明，教室朝阳；使用手清洁用品促进儿童手卫生；用消毒剂消毒水杯保证儿童饮水卫生；加强晨检及病例隔离或首发病例隔离，可显著降低班手足口病传播的风险。

公共卫生意义：本研究证实了采取改善幼托机构环境，加强消毒和卫生管理，以及晨检和病例隔离等综合防控措施，可有效减少托幼机构手足口病传播的风险。建议针对本研究结果，开展干预性研究，为托幼机构预防和控制手足口病传播提供科学依据。

Acknowledgement

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 - Yiwu Municipal CDC
 - Jiashan County CDC

Case- and control- classrooms

- 420 classrooms from 321 daycare
 - From May 1- June 30
 - Reported at least one HFMD case
 - In 2 counties of Zhejiang province

- 30 cases from 22 daycare
- 60 control from 188 daycare

Lack of ventilation, no separate towel and no separate cup had the higher OR (≥ 2.9)

	N. of Exposed		% Exposed		OR	95%CI
	Case (n=30)	Control (n=47)	Case	Control		
Lack of ventilation	2	0	6.7	0	∞	0.30- ∞
No separate towel	5	3	17	6.4	2.9	0.51-20
No separate cup	2	1	6.7	2.1	3.3	0.16-198

We created a score for 7 main risk factors

	Average score	95%CI of score	OR	95%CI
Case	1.7	1.3-2.1	4.1	1.9-9.0
Control	0.79	0.61-0.97		

We scored another 24 factors studied

- 1 risk factor exposed = 1 point
- The score of case-classes and control-classes were not statistically different

	Average of score	95%CI of score	OR	95%CI
Case	4.0	3.3-4.8	1.1	0.90-1.4
Control	3.5	2.9-4.2		

Epidemic of hand, foot, mouth disease (HFMD) in China during 2008-2010

- 3,4 million cases reported: children <5y accounted for 93%
 - 43,000 severe cases
 - Brain stem encephalitis and pulmonary failure
 - 1,400 deaths
 - children <5y accounted for 98%
- 543 localized outbreaks reported
 - 82% occurred in daycare

HFMD became nationally reportable in May 2nd, 2008

- Individual HFMD case reported through National Notifiable Disease Direct Reporting System
- Mandatory follow-up of daycare cases by community doctors