

# Respirator Use Evaluation in California Acute Care Hospitals II

Lauren Joe, MPH  
CDC/CSTE Applied Epidemiology Fellow  
California Department of Public Health  
Occupational Health Branch

NIOSH Personal Protective Technology  
Stakeholder Meeting  
March 20, 2012

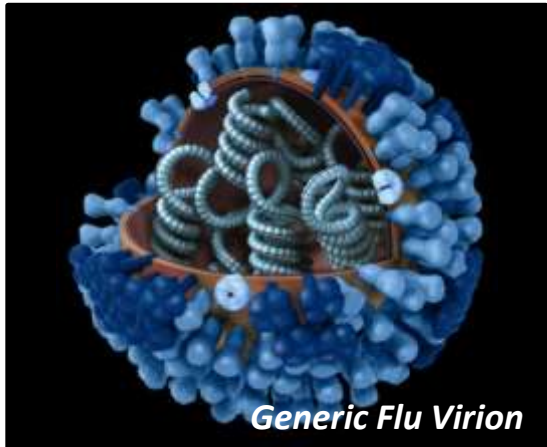
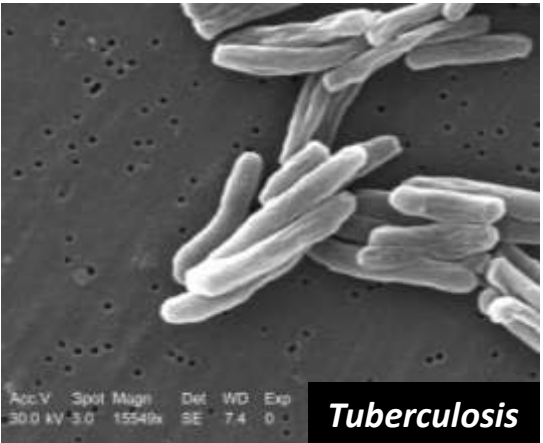
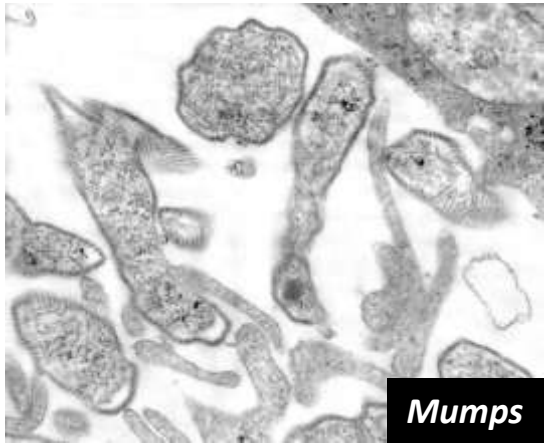


# Background: Aerosol transmissible diseases

## Diseases Requiring Droplet Precautions

## Diseases Requiring Airborne Precautions

## Respiratory Protection

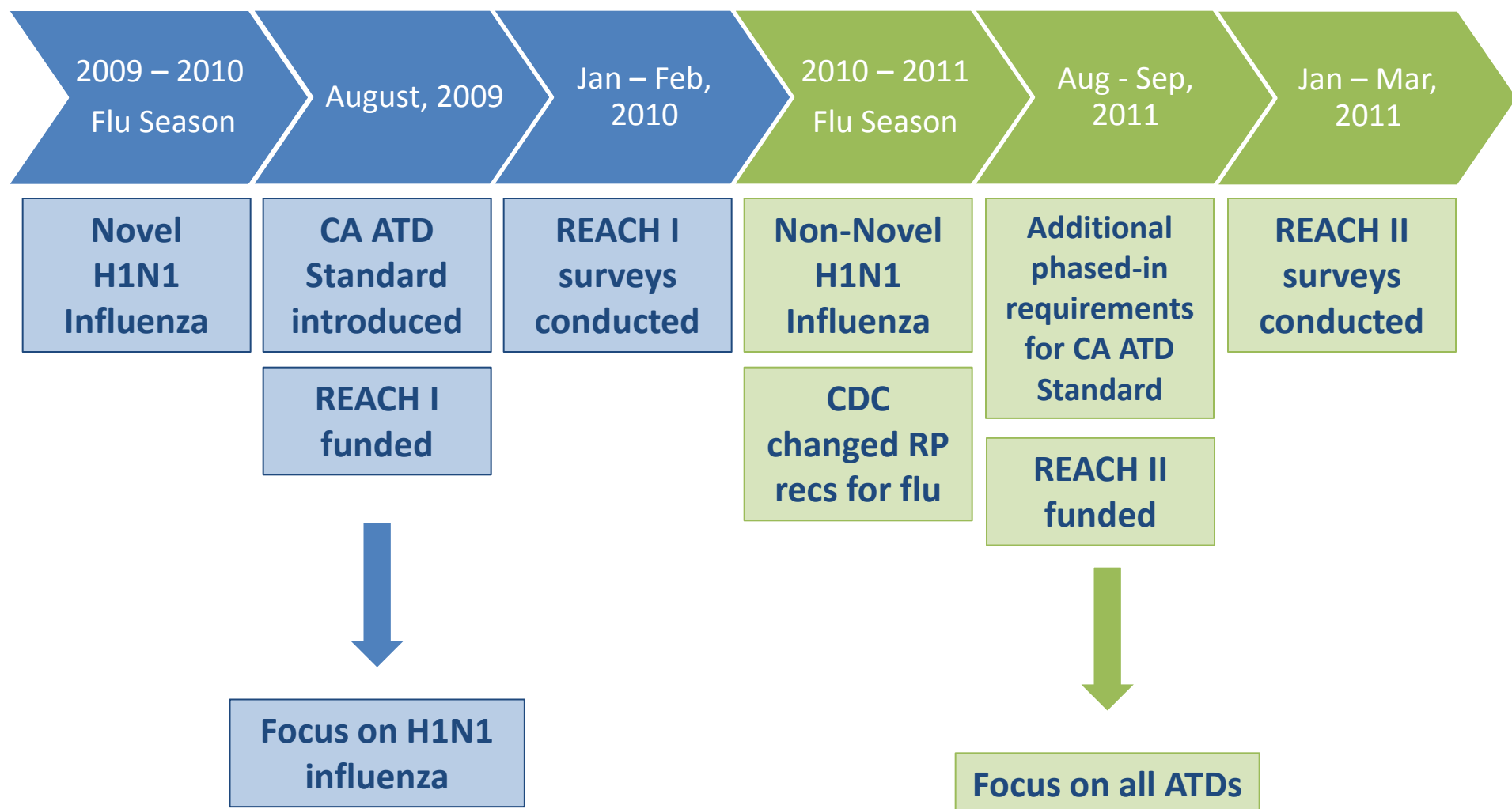


All images in this presentation are from the CDC Public Health Image Library (<http://phil.cdc.gov/phil/home.asp>)

# Background: Cal/OSHA standards

- Respiratory Protection Program (RPP)
  - Cal/OSHA Title 8 CCR § 5144
- Aerosol Transmissible Disease Exposure Control Plan (ATDP)
  - Cal/OSHA – Title 8 CCR § 5199

# Background: REACH I & II timeline



# Background: Objectives

- Describe successes/problems when implementing RPPs and ATDPs
- Assess respirator usage by health care workers (HCWs)
- Make recommendations for ensuring effective RPPs and ATDs

*Approved by NIOSH and CDPH IRBs as public health practice*

# Background: Project overview

- Conducted in-person interviews
  - Hospital managers (HM)
  - Unit managers (UM)
  - Health care workers (HCWs)
- Observed HCWs demonstrate donning/doffing disposable N95
- Reviewed written RPPs and ATDPs
- Provided feedback/recommendations to hospitals

# Methods

## Hospital sampling strategy

- Eligible acute care facilities\*
  - ✓ SF Bay Area
  - ✓ With ED and ICU
- Stratified random sample ( $n=15$ )
  - ✓ Ownership type
  - ✓ Size
  - ✓ Rural/urban status

## Survey tool development

- Interviews
  - ✓ 66 HM questions
  - ✓ 64 UM questions
  - ✓ 59 HCW questions
- Observations
  - ✓ 6 elements
- Written reviews

## Participant selection

- 3 HMs ( $n=43$ )
  - ✓ Nursing
  - ✓ Employee Health
  - ✓ Infection Control
- 3 UMs ( $n=42$ )
  - ✓ ED
  - ✓ ICU
  - ✓ Peds / Med-Surg
- 3 -5 HCWs ( $n=178$ )

\* Available from Office of Statewide Health Planning & Development: 2008 CA hospital usage data, downloaded September 2010. See [http://www.oshpd.ca.gov/hid/Products/Hospitals/Utilization/Hospital\\_Utilization.html](http://www.oshpd.ca.gov/hid/Products/Hospitals/Utilization/Hospital_Utilization.html)

# Results: Hospital distribution ( $n=15$ )

	<i>Rest of CA</i>	<i>Sample</i>	<i>Total</i>	<i>P-value*</i>
<b>Type of Ownership</b>	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	<b>0.94</b>
City/County	17 (5.8)	1 (6.7)	18 (5.9)	
District	25 (8.6)	2 (13.3)	27 (8.8)	
For-profit	61 (20.9)	3 (20.0)	64 (20.8)	
Non-profit	182 (62.3)	9 (60.0)	191 (62.2)	
University	7 (2.4)	0 (0.0)	7 (2.3)	
<b>Size (bed count)</b>				<b>0.76</b>
< 200 beds	144 (49.3)	8 (53.3)	152 (49.5)	
≥ 200 beds	148 (50.7)	7 (46.7)	155 (50.5)	
<b>Rural Status</b>				<b>0.94</b>
Rural	37 (12.7)	2 (13.3)	39 (12.7)	
Non-rural	255 (87.3)	13 (86.7)	268 (87.3)	
<b>Total</b>	<b>292</b>	<b>15</b>	<b>307</b>	

\*Pearson's Chi-squared p-value comparing sample to rest of CA



# Results: HCW characteristics (*n*=178)

		HCW	
Occupation or job title		n	%
	Registered nurse	122	68.54
	Public health nurse	1	0.56
	Nursing assistant	7	3.93
	Technician	7	3.93
	Respiratory therapist	22	12.36
	Other therapist (speech, occupational, etc.)	2	1.12
	Housekeeping	16	8.99
	Phlebotomist	1	0.56
Employee type		n	%
	Employee at facility	172	96.63
	Contract employee	6	3.37
Have you received the influenza vaccine this year?		n	%
	Yes	129	72.47
	No, but I do intend to get it	4	2.25
	No, and I do not intend to get it	44	24.72
	Don't know	1	0.56



# Results: Successful elements



## Medical evaluation & clearance

- Majority responded:
  - ✓ Receive before wearing respirator
  - ✓ Receive at least annually

## Fit testing

- Majority responded:
  - ✓ Receive before wearing respirator
  - ✓ Receive at least annually

## Recordkeeping

- UMs and HMs:
  - ✓ Records maintained by designated department
- HCWs:
  - × 29% informed verbally only which respirator model/size fit tested for

# Results: Training

	HCW		UM (n=41)		HM	
Receive/offer training on HOW to properly use RP?	n	%	n	%	n	%
Yes	166	93.26	40	97.56	40	93.02
No	10	5.62	1	2.44	0	0
Do not know	2	1.12	0	0	3	6.98

	HCW		UM		HM	
Receive/offer training on WHEN to properly use RP?	n	%	n	%	n	%
Yes	170	95.51	41	97.62	41	95.35
No	5	2.81	1	2.38	2	4.65
Do not know	3	1.69	0	0	0	0

How often are HCWs required to attend respirator training?	n	%	n	%	n	%
Once at hire only	6	3.37	0	0.00	1	2.33
Once at hire, then annually	141	79.21	39	92.86	39	90.70
Once at hire then as required	2	1.12	0	0.00	0	0.00
No requirements	6	3.37	1	2.38	0	0.00
Other*	15	8.43	0	0.00	1	2.33
Do not know	8	4.49	2	4.76	2	4.65



How long is the training?	n	%	n	%	n	%
1-15 minutes	78	43.82	17	40.48	19	44.19
16-30 minutes	64	35.96	16	38.10	12	27.91
31-60 minutes	16	8.99	3	7.14	3	6.98
More than 60 minutes	1	0.56	0	0	0	0
Other	15	8.43	1	2.38	1	2.33
Do not know	4	2.25	5	11.90	8	18.60



\*9/15 "other" responses indicated more than once a year

# Results: Respirator selection and use

What are you required to use if you are...

	HCW		UM		HM	
	n	%	n	%	n	%
<b>Close contact with patient who requires airborne precautions?</b>						
	Elastomeric N95	3 1.69	0 0.00	0 0.00	0 0.00	
	Disposable N95	157 88.20	40 95.24	41 95.35		
	PAPR	4 2.25	0 0.00	0 0.00	0 0.00	
	Surgical mask	10 5.62	2 4.76	1 2.33		
	Other	0 0.00	0 0.00	0 0.00		
	Don't know	4 2.25	0 0.00	1 2.33		
	None	0 0.00	0 0.00	0 0.00		
<b>Performing aerosol-generating procedures on patient who requires airborne precautions?</b>						
	Elastomeric N95	7 3.93	0 0.00	0 0.00	0 0.00	
	Disposable N95	98 55.06	21 50.00	17 39.53		
	PAPR	51 28.65	20 47.62	26 60.47		
	Surgical mask	3 1.69	0 0.00	0 0.00		
	Other	2 1.12	1 2.38	0 0.00		
	Don't know	17 9.55	0 0.00	0 0.00		
	None	0 0.00	0 0.00	0 0.00		



Correct response

# Results: Respirator selection and use

What are you required to use if you are...

	HCW		UM		HM	
	n	%	n	%	n	%
<b>Close contact with patient who has the seasonal flu?</b>						
Elastomeric N95	0	0.00	0	0.00	0	0.00
Disposable N95	46	25.84	9	21.43	7	16.28
PAPR	2	1.12	1	2.38	0	0.00
Surgical mask	116	65.17	32	76.19	33	76.74
Other	0	0.00	0	0.00	1	2.33
Don't know	9	5.06	0	0.00	2	4.65
None	5	2.81	0	0.00	0	0.00
<b>Performing aerosol-generating procedures on patient who has the seasonal flu?</b>						
Elastomeric N95	3	1.69	0	0.00	0	0.00
Disposable N95	76	42.70	17	40.48	20	46.51
PAPR	19	10.67	13	30.95	9	20.93
Surgical mask	51	28.65	11	26.19	11	25.58
Other	2	1.12	1	2.38	0	0.00
Don't know	25	14.04	0	0.00	3	6.98
None	2	1.12	0	0.00	0	0.00



Correct response

# Results: Respirator selection and use

What are you required to use if you are...

	HCW		UM		HM	
	n	%	n	%	n	%
<b>Close contact with patient who requires droplet precautions?</b>						
Elastomeric N95	1	0.57	0	0.00	0	0.00
Disposable N95	76	43.43	12	28.57	9	20.93
PAPR	4	2.29	1	2.38	0	0.00
Surgical mask	82	46.86	28	66.67	31	72.09
Other	0	0.00	0	0.00	0	0.00
Don't know	11	6.29	0	0.00	3	6.98
None	1	0.57	0	0.00	0	0.00
<b>Performing aerosol-generating procedures on patient who requires droplet precautions?</b>						
Elastomeric N95	2	1.15	0	0.00	0	0.00
Disposable N95	87	50.00	16	38.10	16	37.21
PAPR	25	14.37	13	30.95	12	27.91
Surgical mask	37	21.26	10	23.81	12	27.91
Other	1	0.57	1	2.38	0	0.00
Don't know	22	12.64	0	0.00	0	0.00
None	0	0.00	0	0.00	0	0.00



Correct response

# Results: Program evaluation



	<i>HCW</i>		<i>UM (n=40)</i>		<i>HM</i>	
Does the facility have a formal RPP evaluation method?	n	%	n	%	n	%
Yes	-		19	47.50	26	60.47
No	-		3	7.50	7	16.28
Don't know	-		18	45.00	10	23.26

	<i>HCW</i>		<i>UM (n=19)</i>		<i>HM (n=26)</i>	
Is HCW input formally solicited during the program evaluation?	n	%	n	%	n	%
Yes	65	36.52	8	42.11	14	53.85
No	99	55.62	4	21.05	7	26.92
Don't know	14	7.87	7	36.84	5	19.23

	<i>HCW</i>		<i>UM</i>		<i>HM</i>	
Are HCWs or UMs formally asked to provide input on RPP policy decisions?	n	%	n	%	n	%
Yes	67	37.64	30	71.43	38	88.37
No	109	61.24	8	19.05	3	6.98
Don't know	2	1.12	4	9.52	2	4.65

	<i>HCW</i>		<i>UM</i>		<i>HM</i>	
Are HCWs observed to make sure they are using RP when required?	n	%	n	%	n	%
Yes	112	62.92	40	95.24	-	
No	53	29.78	2	4.76	-	
Don't know	13	7.30	0	0	-	

	<i>HCW</i>		<i>UM</i>		<i>HM</i>	
Are HCWs observed to make sure they are donning/doffing/disposing of RP properly?	n	%	n	%	n	%
Yes	10	5.65	35	83.33	-	
No	155	87.57	7	16.67	-	
Don't know	12	6.75	0	0	-	

**Note: Written RPP deficiencies included**

- Respirator selection
- Respirator use
- Program evaluation
- Designation of a program administrator

# Results: N95 respirator demonstration observations (N=39)

Observation	Yes		No	
	n	%	n	%
Is the respirator positioned correctly on face?	39	100%	0	0%
Does HCW have facial hair?*	12	32%	26	68%
Are straps correctly placed?	28	72%	11	28%
Were nose clips used?	37	95%	2	5%
Was user seal check performed?	21	54%	18	46%
Was respirator removed properly (used straps)?	26	67%	13	33%

\*During our observations, we were unable to discern whether facial hair was obstructing the seal of the N95. If the facial hair prevents the N95 respirator from properly sealing to the face, a PAPR must be worn instead.



# Recommendations

- Review written RPP/ATDP for completeness
- Ongoing evaluation of RPP/ATDP
  - Input from employees
  - Ensure hospital staff are aware of evaluation
  - Observe donning/doffing of N95s (audits)
- Provide refresher training
  - High-risk clinical symptoms
  - When to use N95s/PAPRs
- Make PAPRs available
  - Inform managers and HCWs about location/availability and high hazard aerosol-generating procedures

# Strengths & limitations

- Some data collection issues
  - Did not identify RP administrator
  - Did not note if facial hair was completely under seal of N95
- Met our overall objectives
  - Understand how RP is being used in the field
  - Made specific recommendations to hospitals
  - Hospitals found participation to be beneficial

# Follow-up meetings: Evaluation questionnaire results

Based on the feedback, what are some things you will likely change about your RPP?

*“We will absolutely utilize the recommendations you have identified. Thank you!”*

“Education to staff, evaluate and follow up.”

“Increase audits and evaluate plan on regular basis.”

“Implement RPP and update ATD.”

Would your hospital benefit from other surveys, like REACH, in the future?

“Yes, it is always good to have a second set of eyes on our hospital operations.”

“Absolutely - because it educates us and gives specific constructive feedback.”

“Possibly - helps to be reminded about Cal/OSHA updates and allow us to be in compliance.”

“Yes - program is informative, non-judgmental and non-punitive.”

# Acknowledgements

## CDPH

- Stella Beckman
- Erica Boston
- Kate Durand
- Suzi Goldmacher
- Bob Harrison
- Barbara Materna

***Note: The findings and conclusions in this presentation have not been formally disseminated by NIOSH and should not be construed to represent any agency determination or policy.***

## NIOSH/ NPPTL

- Maryanne D'Alessandro
- Edward Fries
- Debbie Novak

## REACH Collaborators

- Michigan Public Health Institute
- New York State Dept. of Health
- University of Illinois at Chicago
- University of Minnesota
- University of North Carolina

# Additional Slides

# Results: Medical evaluation & clearance



Do EEs receive medical evaluation and clearance before wearing a respirator?	<i>HCW</i>		<i>UM</i>		<i>HM</i>	
	n	%	n	%	n	%
Yes	164	92.12	38	90.48	40	93.02
No	7	3.93	2	4.76	0	0
Do not know	7	3.93	2	4.76	3	6.98

How frequently are HCWs medically evaluated?	<i>HCW (n=164)</i>		<i>UM (n=38)</i>		<i>HM (n=40)</i>	
	n	%	n	%	n	%
Once at hire, then annually	143	87.20	31	81.58	31	77.50
Once at hire, then as required	9	5.49	2	5.26	3	7.50
No requirements	1	0.61	0	0.00	0	0.00
Other	3	1.83	2	5.26	5	12.50
Don't know	8	4.88	2	5.26	1	2.50

# Results: Fit testing



	HCW		UM		HM	
Do EEs receive fit testing before being allowed to wear an N95?	n	%	n	%	n	%
Yes	169	94.94	41	97.62	41	95.35
No	3	1.69	0	0	0	0
Do not know	3	1.69	1	2.38	2	4.65
N/A	3	1.69	0	0	0	0
	<b>HCW (n=171)</b>		<b>UM</b>		<b>HM (n=42)</b>	
How often do HCWs receive fit testing?	n	%	n	%	n	%
Once at hire only	5	2.92	0	0.00	1	2.38
Once at hire, then annually	149	87.13	41	97.62	36	85.71
Once at hire then as required	1	0.58	0	0.00	2	4.76
Other	15	8.77	1	2.38	1	2.38
Don't know	1	0.58	0	0.00	2	4.76
	<b>HCW</b>		<b>UM</b>		<b>HM</b>	
How do employees know which model/size they have been fit tested for?	n	%	n	%	n	%
Informed verbally only	51	28.65	10	23.81	11	25.58
Given written copy	66	37.08	8	19.05	11	25.58
Given pocket card or other reminder	43	24.16	18	42.86	12	27.91
Other*	12	6.74	6	14.29	6	13.95
Do not know	6	3.37	0	0	3	6.98

\*Other responses included: Elastomeric N95 is given to EE (4); given written copy and other reminder (2); call occupation health (1); able to wear all N95s in hospital (1); memory (1); written copy of results with manager (1)

# Results: Respirator availability

Are the correct model and size of N95s available when you need them?	HCW (n=176)		UM (n=19)		HM (n=24)	
	n	%	n	%	n	%
Yes	166	94.32	17	89.47	21	87.50
No	9	5.11	2	10.53	1	4.17
Don't know	1	0.57	0	0.00	2	8.33



Does your facility have PAPRs available when employees need them?	HCW (n=177)		UM		HM	
	n	%	n	%	n	%
Yes	131	74.01	37	88.10	41	95.35
No	16	9.04	1	2.38	1	2.33
Don't know	30	16.95	4	9.52	1	2.33





# Results: Workplace safety culture



	HCW		UM		HM	
	n	%	n	%	n	%
<b>The health and safety of workers is a high priority with management where I work.</b>						
Agree	167	93.82	41	97.62	43	100.00
Disagree	7	3.93	1	2.38	0	0.00
Don't know	4	2.25	0	0.00	0	0.00
<b>Workers are provided with training about proper use of respiratory protection.</b>						
Agree	174	98.31	41	97.62	43	100.00
Disagree	2	1.13	1	2.38	0	0.00
Don't know	1	0.56	0	0.00	0	0.00
<b>Management seeks feedback from workers about health and safety issues.</b>						
Agree	151	84.83	38	90.48	41	95.35
Disagree	19	10.67	3	7.14	2	4.65
Don't know	8	4.49	1	2.38	0	0.00

# Results: Written RPP review

Written RPP Present?	n	%
Yes	10	66.67
No	5	33.33

Program element required by Cal/OSHA	Present		Partial/Incomplete		Missing	
	n	%	n	%	n	%
Designated program administrator	7	46.67	1	6.67	7	46.67
Medical evaluation	5	33.33	8	53.33	2	13.33
Fit testing	8	53.33	6	40.00	1	6.67
Recordkeeping	5	33.33	5	33.33	5	33.33
Training and information	4	26.67	8	53.33	3	20.00
Respirator selection	4	26.67	5	33.33	6	40.00
Use of respirators	4	26.67	4	26.67	7	46.67
Maintenance and care of respirators	6	40.00	3	20.00	6	40.00
Program evaluation	4	26.67	1	6.67	10	66.67

# Results: Written ATDP review

Written RPP Present?	n	%
Yes	14	93.33
No	1	6.67

Program element required by Cal/OSHA	Present		Partial/Incomplete		Missing	
	n	%	n	%	n	%
Document the hazard assessment and identify jobs and tasks requiring controls	8	53.33	5	33.33	2	13.33
Source control procedures and implementation	13	86.67	0	0.00	2	13.33
Procedures for medical services pre and post exposure for employees	7	46.67	7	46.67	1	6.67
Procedures for communication with employers outside the facility regarding exposures	7	46.67	3	20.00	5	33.33
Procedures for ensuring an adequate supply of PPE	7	46.67	1	6.67	7	46.67
Training	11	73.33	2	13.33	2	13.33
Recordkeeping	6	40.00	7	46.67	2	13.33
Program evaluation	7	46.67	6	40.00	2	13.33
Surge procedures	2	13.33	3	20.00	10	66.67

# Follow-up meetings

- Requested meetings with all 15 hospitals
  - 11 (73%) agreed
    - 5 in-person
    - 6 teleconference
- Provided results and recommendations
  - Summarized and specific to hospital
- Evaluation questionnaire
  - Completed by 43 HMs from 10 hospitals

# Follow-up meetings: Evaluation questionnaire results

	<i>HMs/UMs</i>	
<b>Participation in REACH II helped managers to evaluate the effectiveness of our hospital's RPP.</b>	<b>n</b>	<b>%</b>
Strongly agree	28	65.12
Agree	13	30.23
Neutral	0	0
Disagree	0	0
Strongly Disagree	0	0
<i>No response</i>	2	4.65
<b>Participation in REACH II helped managers to identify strengths within our hospital's RPP.</b>	<b>N</b>	<b>%</b>
Strongly agree	26	60.47
Agree	15	34.88
Neutral	0	0
Disagree	0	0
Strongly Disagree	0	0
<i>No response</i>	2	4.65
<b>Participation in REACH II helped managers to identify areas of improvement within our hospital's RPP.</b>	<b>n</b>	<b>%</b>
Strongly agree	31	72.09
Agree	10	23.26
Neutral	0	0
Disagree	0	0
Strongly Disagree	0	0
<i>No response</i>	2	4.65