

# **Impact of COVID-19 on Infection in Long-Term Care Facilities: Focus on Multidrug-Resistant Organisms**

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# COVID-19 in Nursing Homes

## Overview

- The initial US COVID-19 nursing home outbreak
- NHSN Nursing Home COVID-19+ reporting for residents & staff
- Why is COVID-19 a problem in nursing homes?
- Who develops post-viral bacterial superinfection?
- When and where do post-viral bacterial co-infections occur?
- What factors contribute to the acquisition of MDRO?
- How will the pandemic affect MDRO in nursing homes?
- What can be done now?

## COVID-19 in a Long-Term Care Facility — King County, Washington, February 27–March 9, 2020

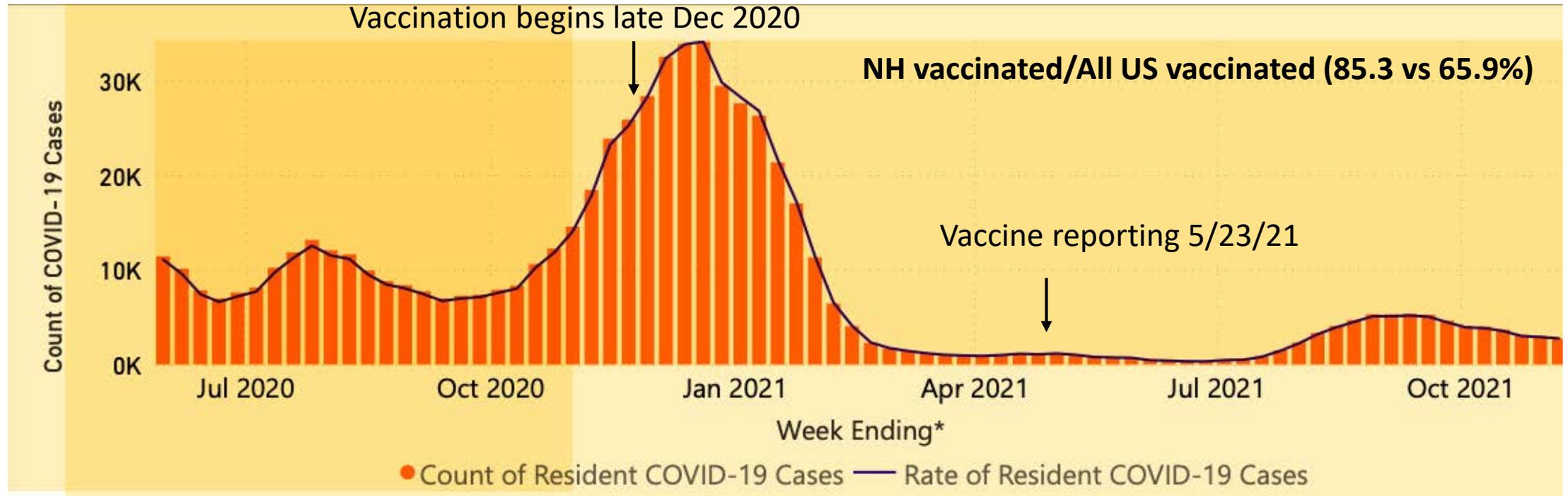
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COVID-19 Infections  
N=130

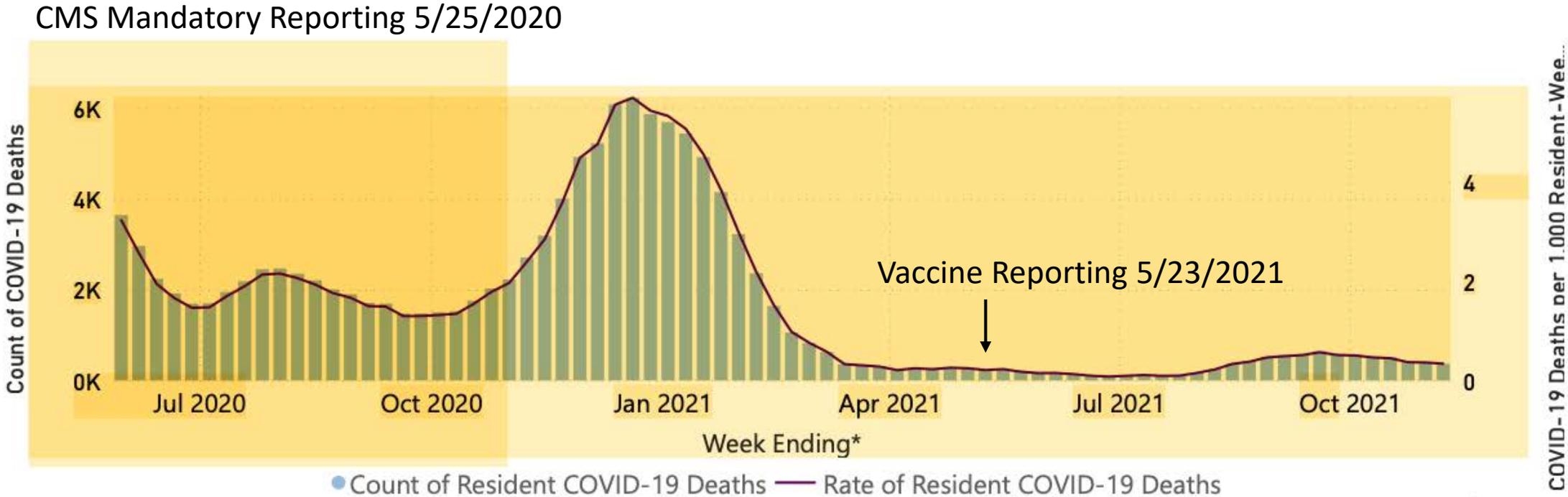
Residents	N=81
Staff	N=34
Visitors	N=14

# US Nursing Home Residents COVID-19 Cases per 1000 Resident weeks

CMS Mandatory Case Reporting 5/25/2020



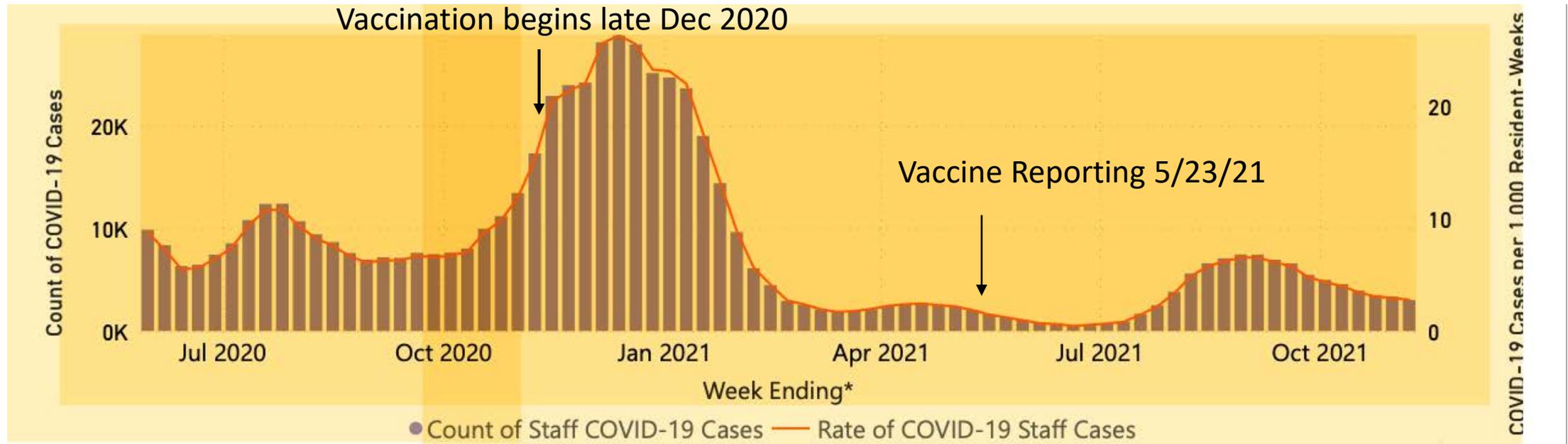
# US Nursing Home Residents COVID-19 Deaths per 1000 Resident weeks



[www.cdc.gov/nhsn/covid19/ltc-report-overview](http://www.cdc.gov/nhsn/covid19/ltc-report-overview).

# US Nursing Home Staff COVID-19 Cases per 1000 Resident weeks

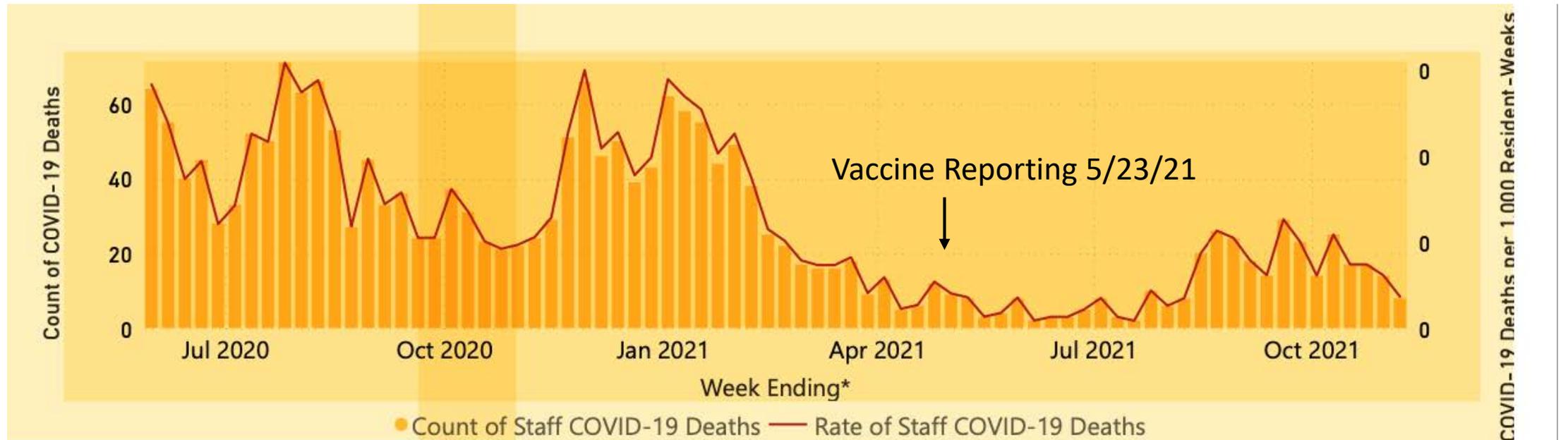
CMS Mandatory Case Reporting 5/25/2020



[www.cdc.gov/nhsn/covid19/ltc-report-overview](http://www.cdc.gov/nhsn/covid19/ltc-report-overview).

# US Nursing Home Staff COVID-19 Deaths per 1000 Resident weeks

CMS Mandatory Case Reporting 5/25/2020



# COVID-19 & Nursing Home Residents

## Why The Impact?

- Dysregulated host response
  - increasing age
  - multiple co-morbid illnesses
  - decline in functional reserve
- Viral virulence factors
- Compliance infection control/PPE use
- Immunization rates
  - active & passive approaches
  - residents & staff
  - vaccine efficacy/duration effect
- Secondary bacterial (post-viral) infection
- Complications of healthcare
  - healthcare-associated infection (HAIs)
  - MDROs

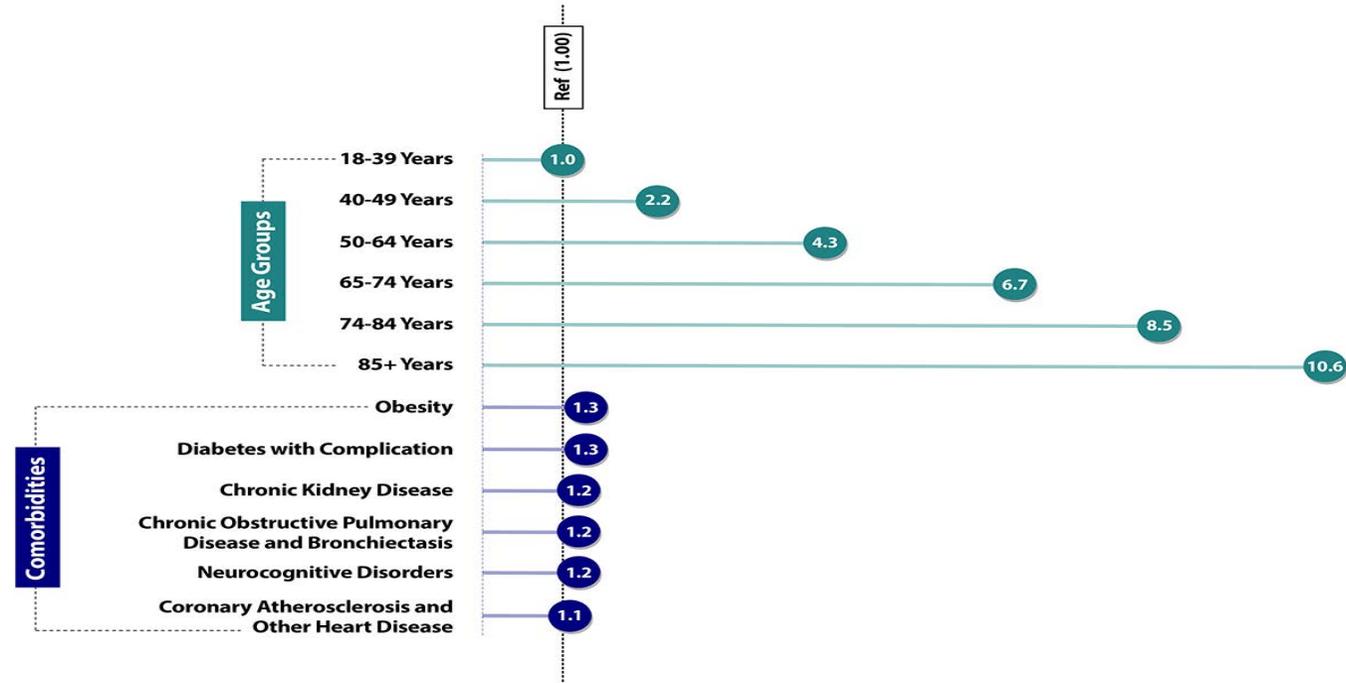
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# COVID-19 Medical Conditions & Severe Illness Hospitalized Adults (n=540,667), March 2020–2021

COVID-19 Death Risk Ratio (RR) for Select Age Groups and Comorbid Conditions



Kompaniyets L, et al. [https://www.cdc.gov/pcd/issues/2021/21\\_0123.htm](https://www.cdc.gov/pcd/issues/2021/21_0123.htm)

# COVID-19 Medical Conditions & Severe Illness Hospitalized Adults (n=540,667), March 2020–2021

**COVID-19 Death Risk Ratio (RR) Increases as  
the Number of Comorbid Conditions Increases**



Kompaniyets L, et al. [https://www.cdc.gov/pcd/issues/2021/21\\_0123.htm](https://www.cdc.gov/pcd/issues/2021/21_0123.htm)  
<https://data.cms.gov/covid-19/covid-19-nursing-home-data> 10/3/21  
[CDC COVID Data Tracker](#) 10-17-21

# COVID-19 & Nursing Home Residents

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# Non-Influenza Outbreaks in LTCF

## Should We Have Anticipated the Impact of Respiratory Viruses?

<b>Virus</b>	<b>Attack Rate %</b>	<b>LRTI %</b>	<b>Transfer %</b>	<b>Death Rate %</b>	<b>Culture (+)</b>	<b>RT-PCR (+)</b>
<b>RSV</b>	42	-	0.1	14.3	2/22	7/22
<b>hMPV</b>	22-72	21-50	-	16.1	2/13	6/13
	18	31	5	-	0/20	5/14
<b>Rhinovirus</b>	24	33	38	5	-	4/10
	62	52	16	6	-	6/19
	100	27	1.8	21	7/13	7/13

Caram LB et al., JAGS 2009;57:482.; Boivin G et al. CID 2007;44:1152.;  
 Louie JK et al. CID 2007;196:705.; Hicks LA et al., JAGS 2006;54:284.

# COVID-19 & Nursing Home Residents

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- Secondary bacterial (post-viral) infection
- Complications of healthcare
  - healthcare-associated infection (HAIs)
  - MDROs

# COVID-19 Prevention Guidance for LTCF (CMS 4-2-2020)

## Compliance an issue

- Focus on hand hygiene
  - Lack of hand hygiene compliance - 36%
- Follow CDC PPE recommendations
  - Lack of PPE
  - Lack of compliance facemasks - 25%
- Symptom screening for all residents, staff, & visitors
- Dedicated units for infected residents with dedicated staff
- Isolate new admissions for 14 days
- Maintain strict infection control practices and testing protocols
- Limit facility access/visitation

<https://www.cms.gov/files/document/4220-covid-19-long-term-care-facility-guidance.pdf>

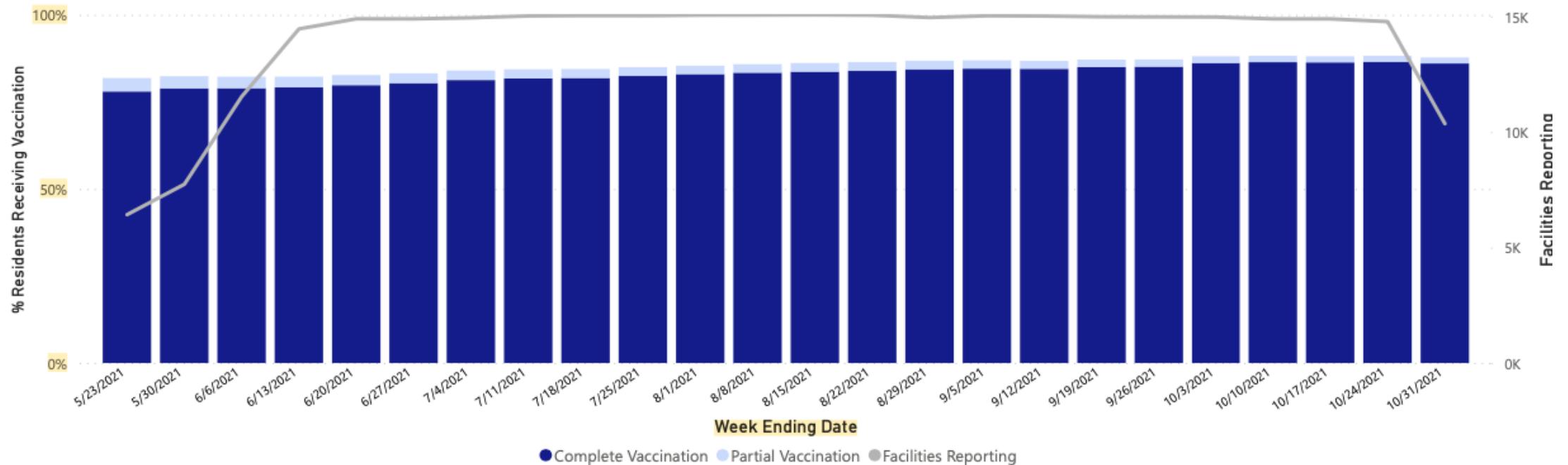
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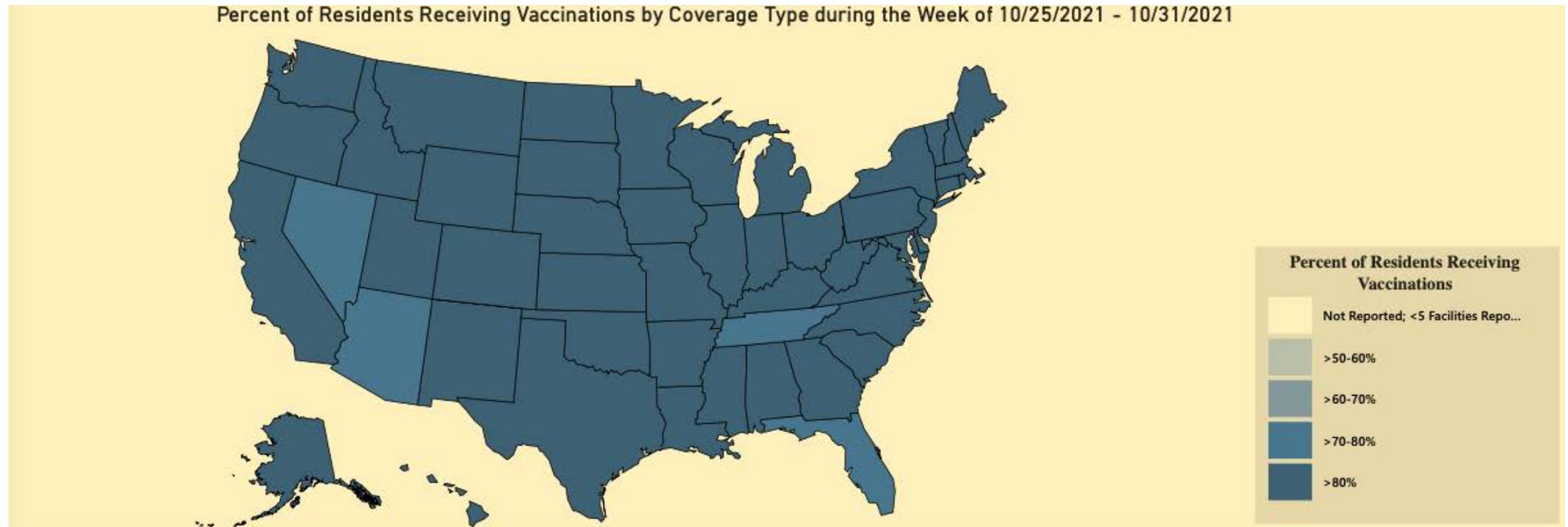
# US Nursing Home Residents COVID-19 Vaccination Compliance

Mandatory Reporting - 5/13/21



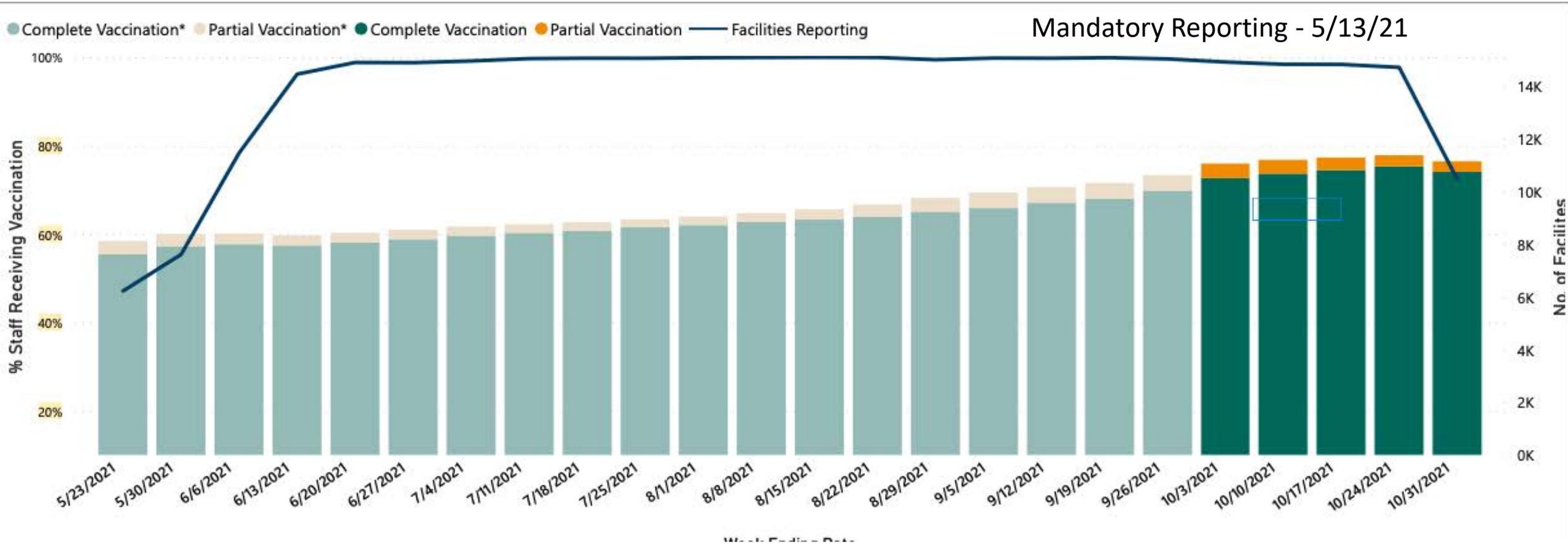
<https://www.cdc.gov/nhsn/covid19/ltc-vaccination-dashboard.html>

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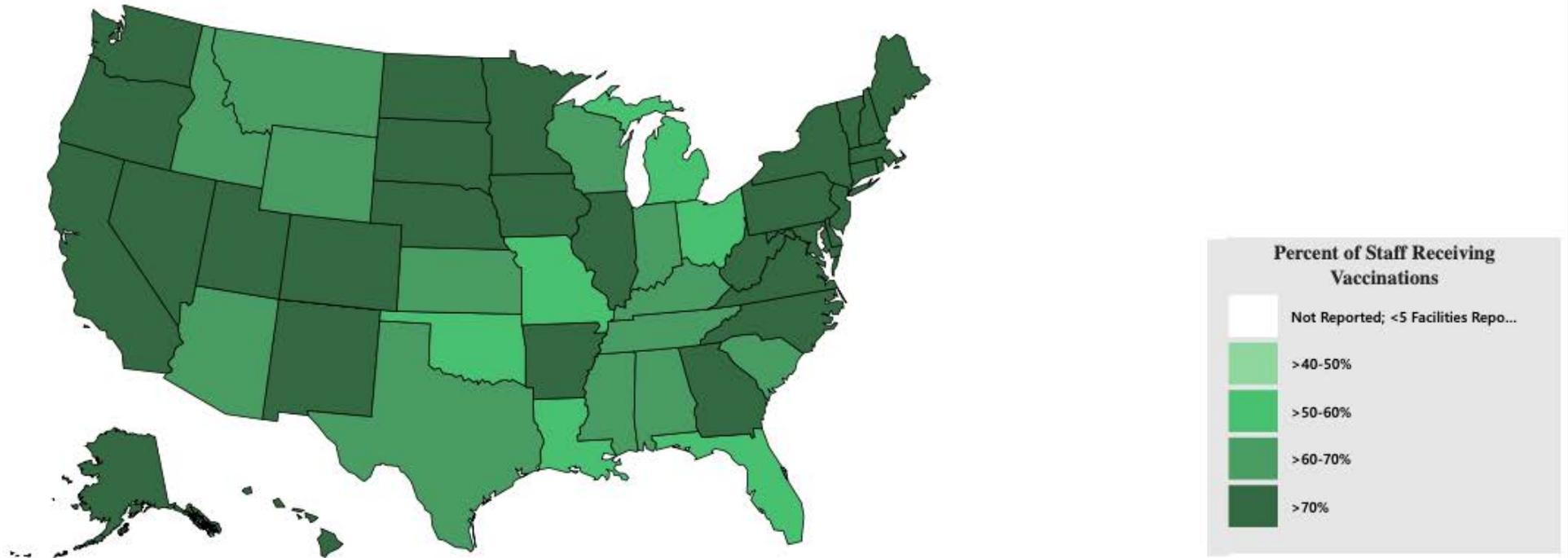
<https://www.cdc.gov/nhsn/covid19/ltc-vaccination-dashboard.html>

# US Nursing Home Staff COVID-19 Vaccination Compliance



# US Nursing Home Staff COVID-19 Vaccination - Compliance

Percent of Staff Receiving Vaccinations by Coverage Type during the Week of 10/25/2021 - 10/31/2021



<https://www.cdc.gov/nhsn/covid19/ltc-vaccination-dashboard.html>

# COVID-19 & Nursing Home Residents

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- **Post-viral (secondary) bacterial infection**
- Complications of healthcare
  - healthcare-associated infection (HAIs)
  - MDROs

# COVID-19 & bacterial co-infection

## Why is this an issue of concern in LTCF?

- Is antibacterial therapy necessary?
  - Meta-analysis 154 studies (Langford BJ et al. CMI 2021;27:520-531)
    - antibiotics given 74.6% (95% CI 68.3–80.0%) cases
    - bacterial co-infection present 8.6% (95% CI 4.7–15.2%) cases
    - Bacterial infection increases with age per decade [OR 1.45 (95% CI 1.18–1.77)].
- Will increase antibiotic use drive resistance?

# Viruses & bacterial co-infection

## Prior experience

- Other post-viral secondary bacterial infection complications
  - Influenza - 11-35% cases
    - pneumococci, *S. aureus*, *S. pyogenes*
  - Influenza
    - 5-fold increase in older adults & underlying illness vs young, healthy
  - SARS-CoV-1 - 20% cases

Klein EY et al. Influenza Other Resp Viruses 2016;10:394-403; Chertow DS et al. JAMA 2013; 309:275-282.;

Zheng Z et al. Chin J Resp Crit Care Med 2003;2:270-274; Yap FHY et al. Clin Infect Dis 2004; 39:511-516.

# COVID-19 & Nursing Home Residents

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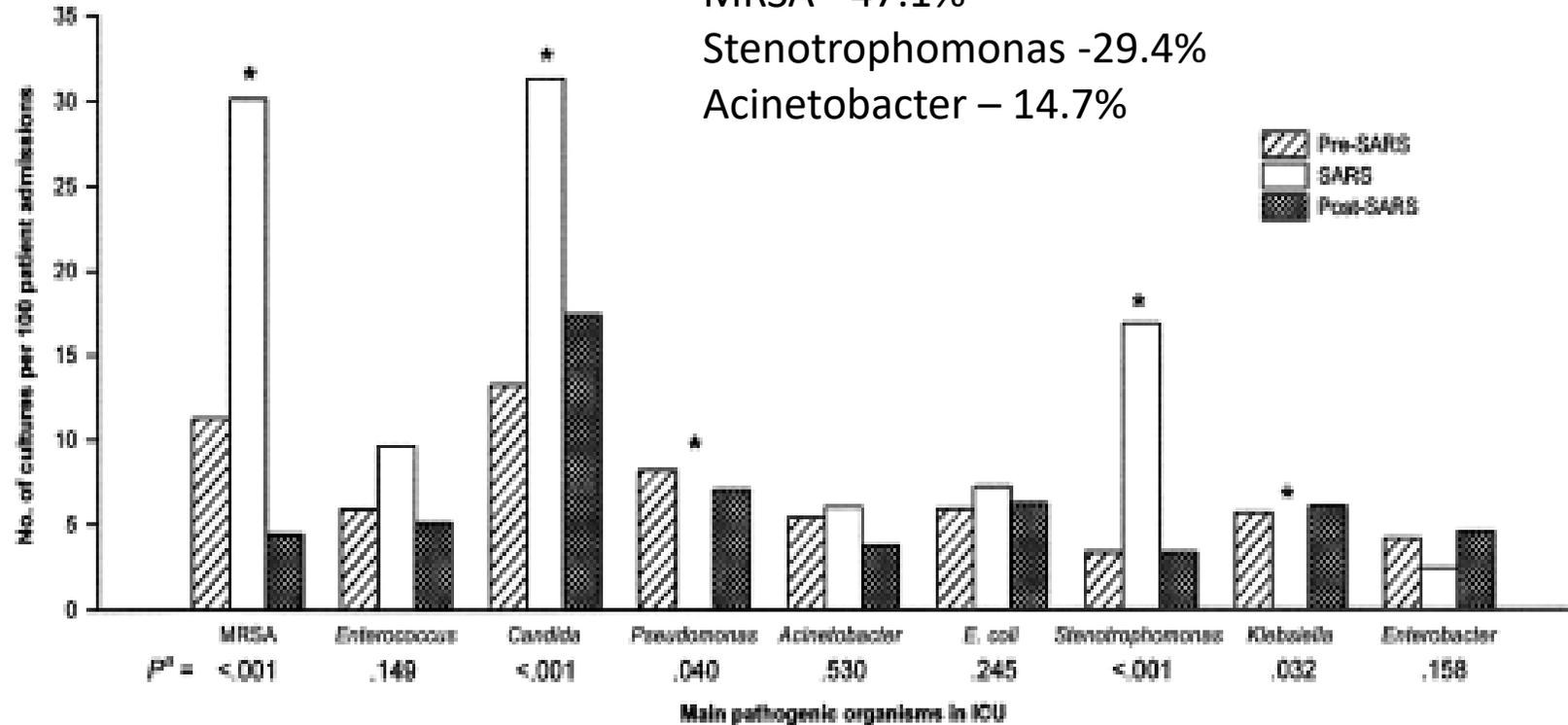
# Isolation of pathogens before and after SARS-CoV-1 in an ICU (N=85)

Ventilator-associated pneumonia (n=30)

MRSA - 47.1%

Stenotrophomonas - 29.4%

Acinetobacter - 14.7%



Yap FHY et al. Clin Infect Dis 2004;39:511-516.

# COVID-19 & bacterial co-infections

## Early (admission) vs Late (nosocomial)

- COVID-19 patients admitted from the community (early infection)
  - All secondary infections 3-6%
    - *S. pneumoniae* 57.1%
    - *S. aureus* 16.7-28.6%
- All hospitalized COVID-19 patients (meta-analysis 18 studies)
  - 8,249/14,360 (57.4%) cultures done
  - Any co-infection present 33.1% (95% CI 18.0-52.6%), p=0.00
  - *S. aureus* 25.6% (95%CI 15.6-39.0), p=0.003
  - MRSA/All *S. aureus* (5 studies) 53.9% (95%CI 24.5-80.9), 0.000

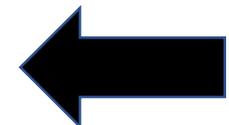
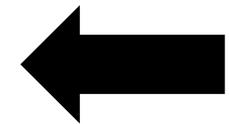
Adeiza SS et al. AMS Hyg Infect Control 2020;15; Garcia-Vidal C. CMI 2021;27:83-88, Hughes S et al. CMI 2020; 26: 1395-1399.

## COVID-19 & bacterial co-infection (late): HAIs

- Hospital acquired VAP
  - *S. aureus* (36.4%), *P. aeruginosa* (27.3%), *Stenotrophomonas* (18.2%)
- Covid-19 & *S. aureus* – meta-analysis 28 articles.
  - 115 co-infections – MRSA (49.6%)
    - BSI (64.3%)
    - PNA (55.7%)
  - post-admission 76.5%
  - mechanical ventilation 74.8%
  - CVC 19.1%
  - corticosteroids 13.0%

# Hospital NHSN HAI Standardized Infection Ratios Changes 2019 vs 2020

	2020 Q1	2020 Q2	2020 Q3	2020 Q4
CLABSI	↓ -11.8%	↑ 27.9%	↑ 46.4%	↑ 47.0%
CAUTI	↓ -21.3%	No Change <sup>1</sup>	↑ 12.7%	↑ 18.8%
VAE	↑ 11.3%	↑ 33.7%	↑ 29.0%	↑ 44.8%
SSI: Colon surgery	↓ -9.1%	No Change <sup>1</sup>	↓ -6.9%	↓ -8.3%
SSI: Abdominal hysterectomy	↓ -16.0%	No Change <sup>1</sup>	No Change <sup>1</sup>	↓ -13.1%
Laboratory-identified MRSA bacteremia	↓ -7.2%	↑ 12.2%	↑ 22.5%	↑ 33.8%
Laboratory-identified CDI	↓ -17.5%	↓ -10.3%	↓ -8.8%	↓ -5.5%



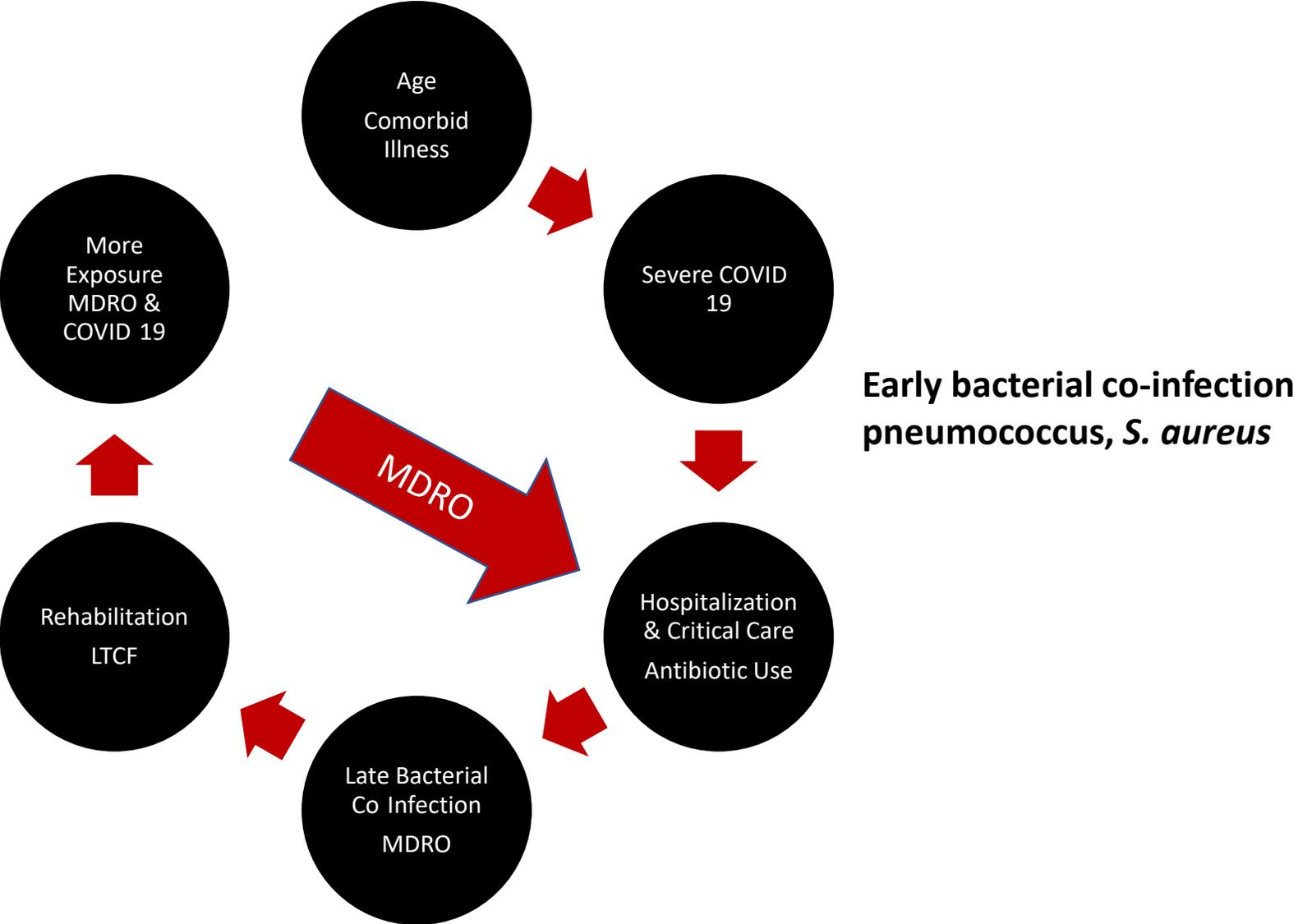
# MDRO in COVID-19 pneumonia: Risk Factors Culture + (N=47)/MDRO + (N=13)

Risk factors for multi-drug resistant organism isolation in patients with coronavirus disease 2019 pneumonia

Risk factor	Univariate analysis		Multivariate analysis	
	OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Age	1.05 (0.99 - 1.11)	.10		
LTCF stay before diagnosis of COVID-19	4.00 (0.98 - 16.26)	.05	6.09 (1.02 - 36.49)	.048
Single room stay after diagnosis of COVID-19 vs. shared room	0.25 (0.06 - 1.02)	.05		
Central venous catheter	10.08 (1.91 - 53.18)	.01		
Mechanical ventilation	6.25 (1.54 - 25.42)	.01		
Use of systemic corticosteroids	11.50 (2.17 - 61.04)	.004	15.07 (2.34 - 97.01)	.004

Son H-j wr L. Am J Infect Control 2021;49:1256-1261.

# Impact of Age, LTCF & COVID-19 on MDRO & Antibiotic Use



# COVID-19 & Nursing Home Residents

## What can we do to prevent COVID-19?

- Limit viral infection introduction - symptomatic & asymptomatic
  - use of routine & rapid testing
  - Improving ventilation
- Improve host response
  - passive immunity - monoclonal antibody for residents
  - active immunity - vaccination for residents & staff
  - booster doses
- Base isolation procedures using local epidemiology
  - Tiered approach
    - local COVID-19 rates
    - institution vaccinate rates
    - recent COVID-19 infections

# VA Community Living Center (CLC) COVID-19 Moving Forward Plan v2.0 – 7/2/21

	Stage 1	Stage 2	Stage 3
Parameters	<p>&gt; 10% county (+) rate &lt; 70% pts fully vaccinated 1 case in past 14 days</p>	<p>5-10% county (+) rate &gt; 70% pts fully vaccinated No new cases &gt; 14 days</p>	<p>&lt; 5% county (+) rate &gt; 70% pts fully vaccinated No new cases &gt; 14 days</p>
Admissions	<p>No new community admissions May re-admit from hospital Observe &amp; test 2x weekly</p>	<p>Outside hospice admission with negative test within 48 hrs</p> <p>Admit from other local VA - observe 7 days with PCR test on admission and repeat day 7</p>	<p>Accept community admissions - observe 7 days with PCR test on admission and repeat day 7</p>
Visitors	<p>Compassionate care only one visitor at a time</p>	<p>Outdoor visits or in isolated indoor areas</p>	<p>Outdoor visits or in isolated indoor areas</p>
Activities/Dining	<p>1:1 activity large area, HH, social distancing, masking</p>	<p>Group activities &lt; 10 pts indoor and outdoor with precautions, limited communal dining, pet therapy</p>	<p>Group activities &gt; 10 pts indoor and outdoor plus precautions; community outing passes &lt; 24 hrs with observation and testing</p>
Outpatient Medical Visits	<p>Virtually preferred Face to face if medically necessary &amp; outside facility</p>	<p>If outpt/outside facility, observe 7 days and test on day 7.</p>	<p>If outpt/outside facility, observe 7 days and test on day 7.</p>

# COVID-19 & Nursing Home Residents

## Can we prevent MDRO complications in LTCF?

- Limit MDRO introduction into the facility
  - identify which MDRO should be targeted
  - do you have resources for active surveillance?
    - MRSA, carbapenem-R Enterobacteriaceae, *C. auris*
  - should you focus on post COVID-19 survivors?
- Limit spread within the facility
  - continued monitoring and active surveillance for MDROs
  - what isolation precautions should be used?
  - decolonization – universal (CHG) vs targeted (mupirocin)
  - environmental disinfection (*C. auris*)
  - limit unnecessary antibiotics (stewardship)
  - limit unnecessary devices (*C. auris*)

**PREVENTION OF MRSA INFECTIONS IN VHA ACUTE CARE AND COMMUNITY LIVING CENTERS VHA directive 1131(5) Appendix G**

- Hand hygiene
- Active surveillance MRSA
  - admission nares screening all hospital and CLC patients – pcr preferred
  - acute care – also done on transfer to ICU
- Known positive within 12 months - place immediately in precautions
  - Hospital – contact precautions

**PREVENTION OF MRSA INFECTIONS IN VHA ACUTE CARE AND COMMUNITY LIVING CENTERS VHA DIRECTIVE 1131(5) APPENDICES F and G**

- CLC – enhanced barrier or contact precautions
  - single room preferred
  - enhanced barrier - glove and gowns by staff required if high risk activity for transmission
  - may have roommate if other pt has no wounds, no devices, and not immunocompromised

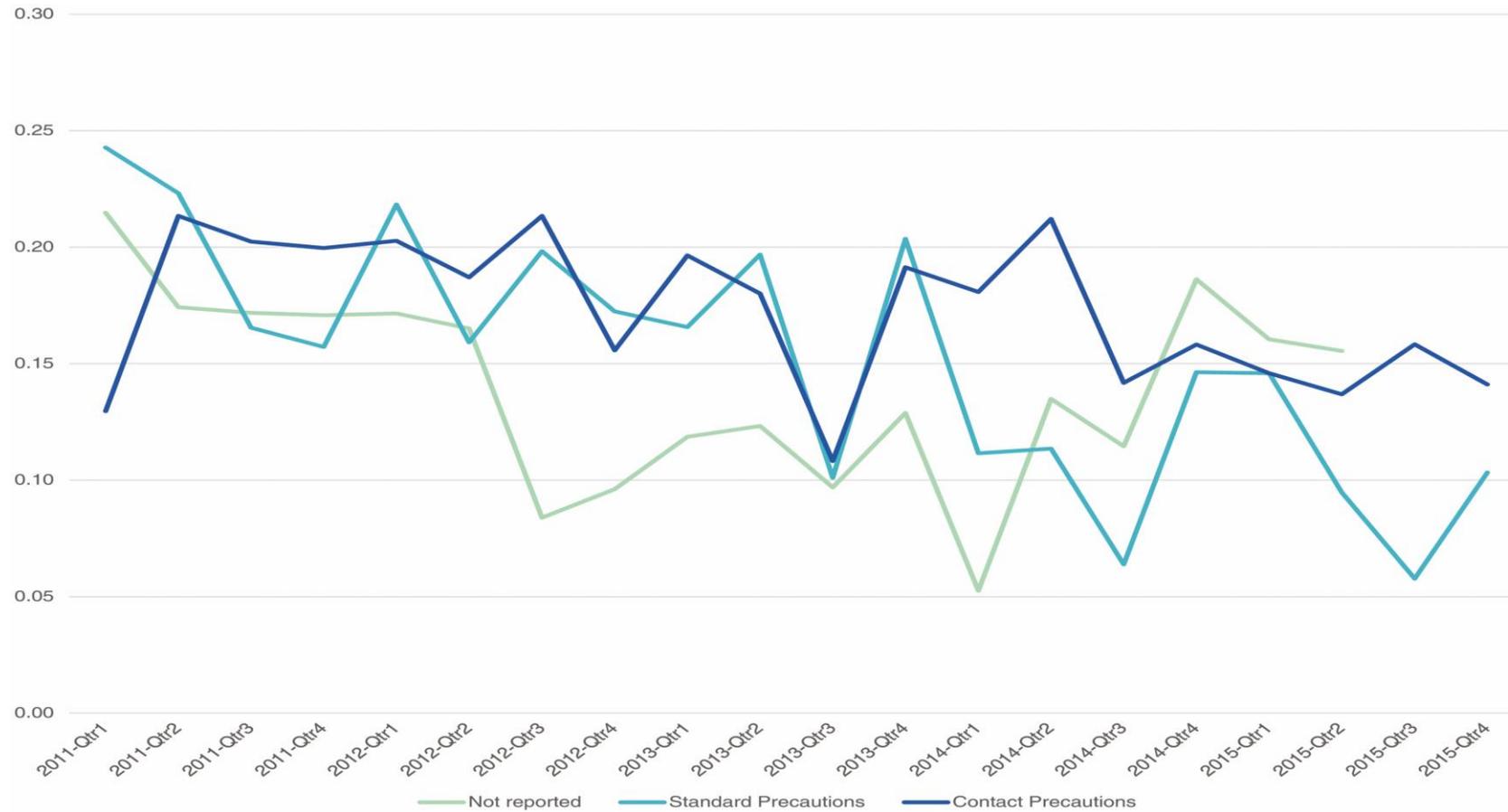
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## Contact vs Standard Precautions: MRSA HAI rate per 1000 pt/days (LTCFs N=74)

RR 1.13 (95% CI 0.74-1.72), p=0.58



**PREVENTION OF MRSA INFECTIONS IN VHA ACUTE CARE AND COMMUNITY LIVING CENTERS VHA DIRECTIVE 1131(5) APPENDICES F and G**

- Discontinuing isolation
  - must be more than one week since positive MRSA
  - obtain surveillance testing from nares and original colonizing or infecting site(s) (culture or pcr).
  - Repeat diagnostic sets 12 hrs later.
  - If both surveillance sets negative, then isolation can be discontinued.
- Discontinued March 2020 to preserve testing materials and PPE
- Reinstated July 2021

# LTCF Residents RGNB+ rectal swabs (N=57): Transmission to Staff PPE by Activity

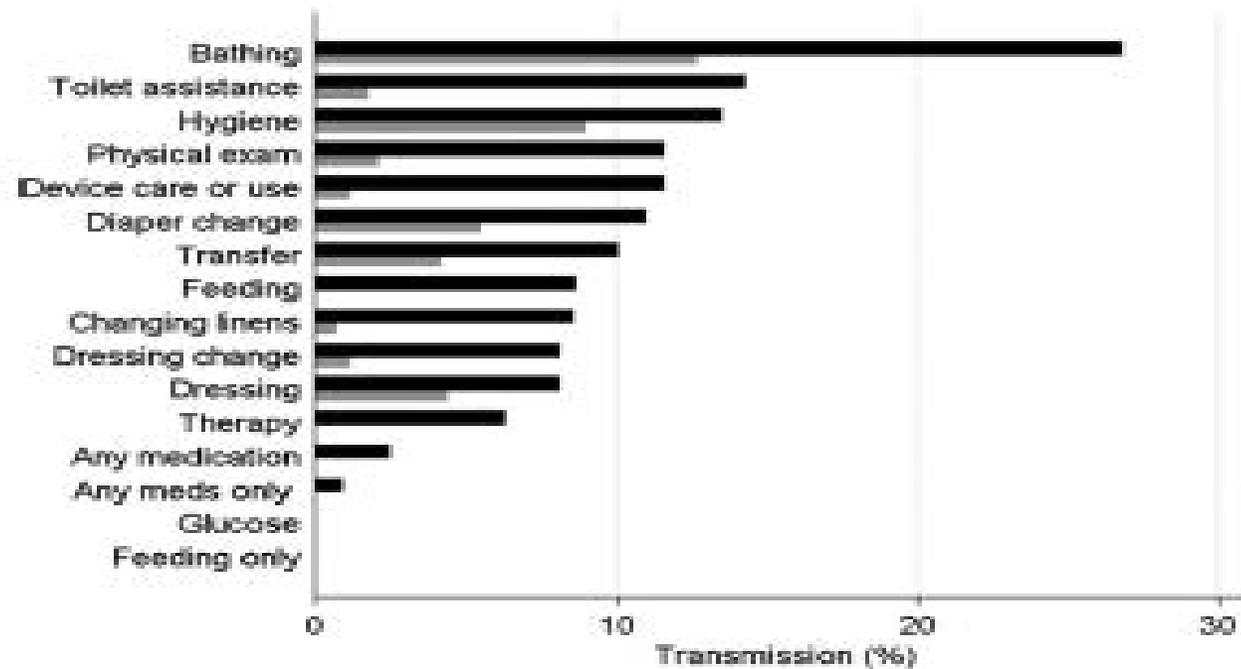


FIG 1 RGNB transmission to HCW gowns and gloves during care of RGNB-colonized residents (n = 57) by type of care provided during 905 interactions. Black bars, transmission to gloves; gray bars, transmission to gowns.

# Israeli National Guidelines CRE Prevention

Ben-David D et al. *Infect Control Hosp Epidemiol* 2014;35:802-809.

Variable	SNF/Subacute/Vents	Rehabilitation Wards
Room assignment	Private room/cohorting	Not required
Dedicated nursing	Not required	Not required
Gloves/Gowns	On room entry	Standard precautions
Admit Screen Hi Risk*	Required	Not routinely required
Screening pt contacts	Required	Required
Group activities	Allowed	Allowed
Mandatory reporting	Yes	Yes

High Risk = transfer other facilities or hospitalization within 6 months.

# Enhanced Barrier Precautions

**CDC 9/30/2019**

- All LTCF residents with wounds or devices
- Colonized or infected residents with novel or targeted MDRO
- Carbapenemase-producing organisms (CPE)
  - Enterobacteriaceae, *Pseudomonas*, *Acinetobacter*
  - *Candida auris*
- Gowns & gloves any high contact resident care-transmission risk
  - toileting, dressing, transfers, hygiene care, changing linens
  - device care or use of device
- If diarrhea, uncontained draining wounds, or secretions, or transmission suspected or documented
  - Restrict to room and PPE required upon room entry

**[www.cdc.gov/hai/containment/PPE-Nursing-Homes.html](http://www.cdc.gov/hai/containment/PPE-Nursing-Homes.html)**

# COVID, MDRO, and LTCF

## Summary

- HAIs due to *S. aureus* (MRSA) and potentially resistant GNB were seen following SARS-CoV-1
- While current data are scant, older adults appear to be at increased risk of:
  - severe COVID-19 & need for hospitalization & critical care
  - antibiotic exposure & acquisition of BSIs, PNA & MDRO
  - bacterial co-infection on admission
  - MDRO co-infection if admitted from a LTCF
  - if they survive, older adults may be a factor in introducing MDROs into LTCF, and ultimately back into hospitals.

# COVID, MDRO, and LTCF

## Summary

- There is a real risk of increasing introduction of antibiotic resistance into healthcare facilities as a consequence of the pandemic.
- Healthcare facilities must work together to reduce the transmission of MDRO
- To break this cycle, LTCF must be prepared to:
  - aggressively prevent COVID-19 through testing, immunization, and isolation procedures
  - identify MDRO of local concern through active surveillance
- Effective infection control methods must be identified that will:
  - be reliably carried out by LTCF while maintaining the goals of care of its residents.
  - use LTCF resources to implement isolation procedures with a high degree of compliance and with an emphasis on hand hygiene and PPE use.
  - Allow reliable implementation of decolonization/decontamination protocols by LTCF; ideal protocols would apply to all MDRO as opposed to individual pathogens.