



# Clostridium difficile infections (CDI) among San Francisco County residents, 2010-2011

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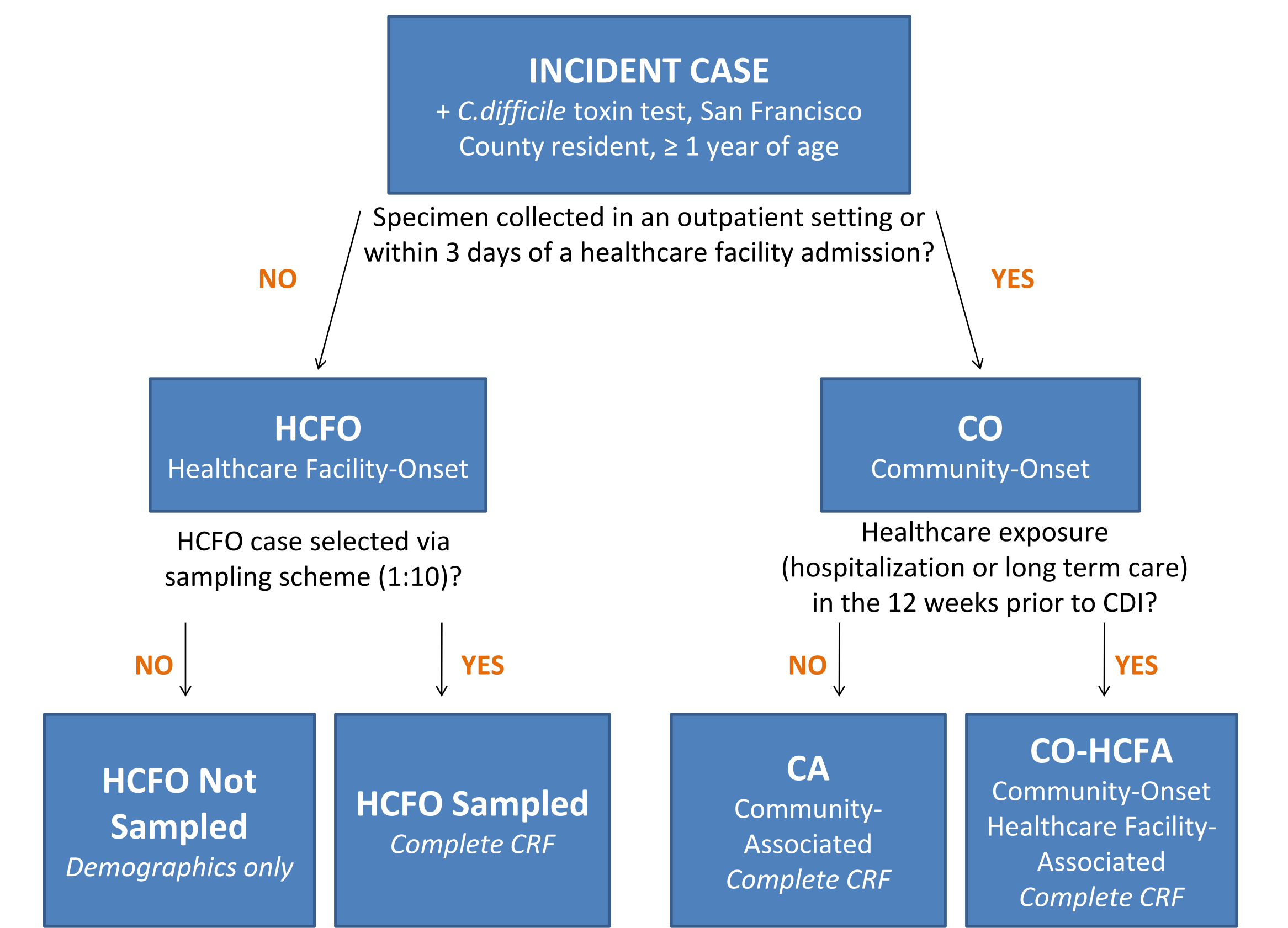
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## Background

- *Clostridium difficile* is a spore-forming, Gram positive bacillus that can lead to an infection with symptoms ranging from mild diarrhea to pseudomembranous colitis, sepsis and death.
- Over the last several years, reports indicate that the incidence and severity of *Clostridium difficile* infection (CDI) have increased.
- Major risk factors for developing CDI include antibiotic use and recent hospitalization; however, CDI is no longer restricted to healthcare settings or populations previously considered high-risk.

## Methods

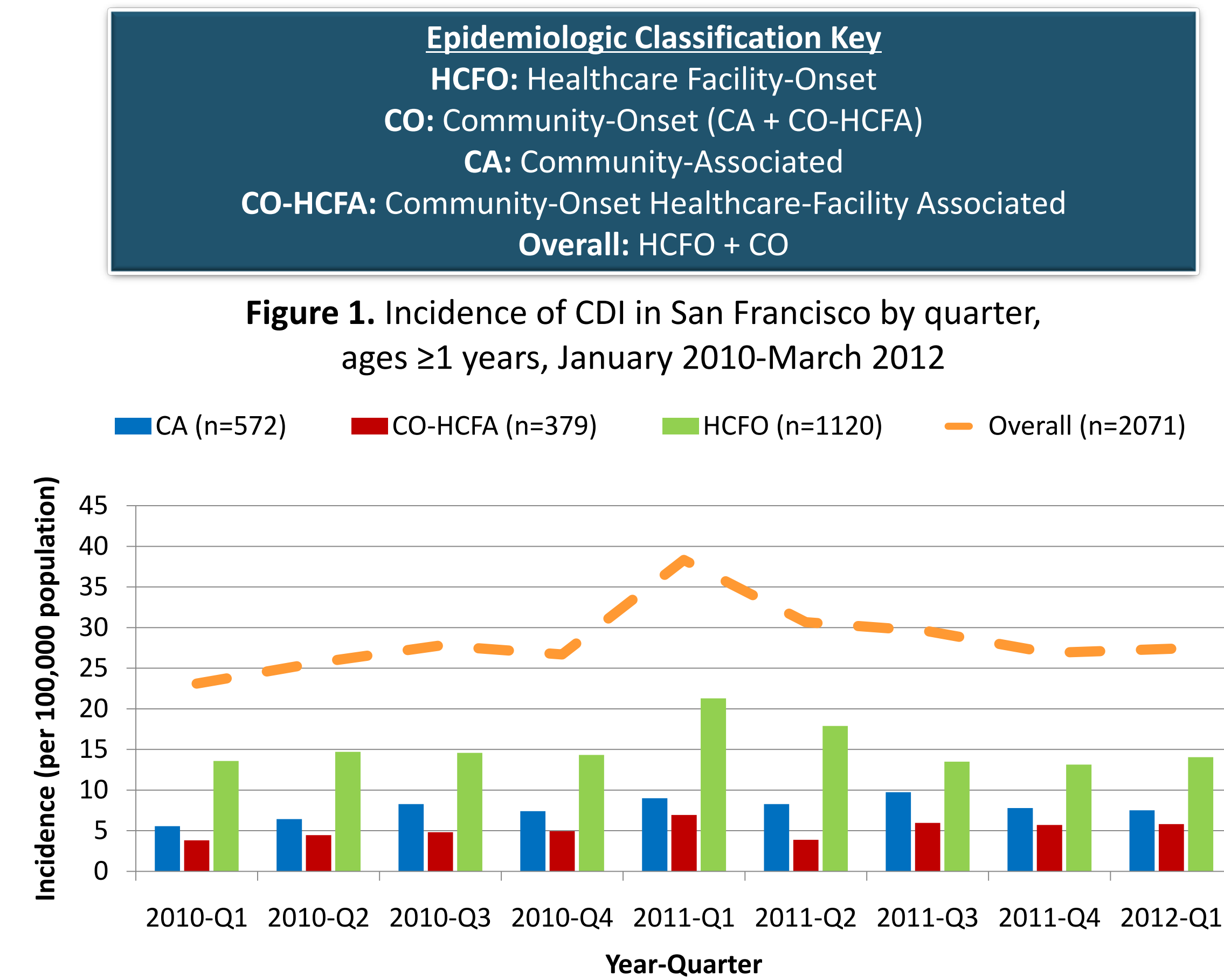


- Active laboratory-based surveillance for CDI was conducted in San Francisco County as part of the Centers for Disease Control and Prevention's (CDC) Emerging Infections Program (EIP).
- Laboratory reports were received from 13 clinical and reference laboratories; medical records were reviewed at hospitals, outpatient clinics and long-term care facilities.
- Incident cases, defined as cases without a prior positive *C. difficile* stool specimen in the last eight weeks, were categorized into four epidemiologic classes: Healthcare Facility-Onset Not Sampled (HCFO Not Sampled), Healthcare Facility-Onset Sampled (HCFO Sampled), Community-Associated (CA) and Community-Onset Healthcare Facility-Associated (CO-HCFA).
- Among CDI cases classified as HCFO, 1:10 were randomly sampled for case report form (CRF) completion.
- Data collected include demographics, clinical findings and acute care exposures.
- California Department of Finance data were used to calculate incidence. SAS Version 9.3 was used for all analyses.

## Acknowledgements

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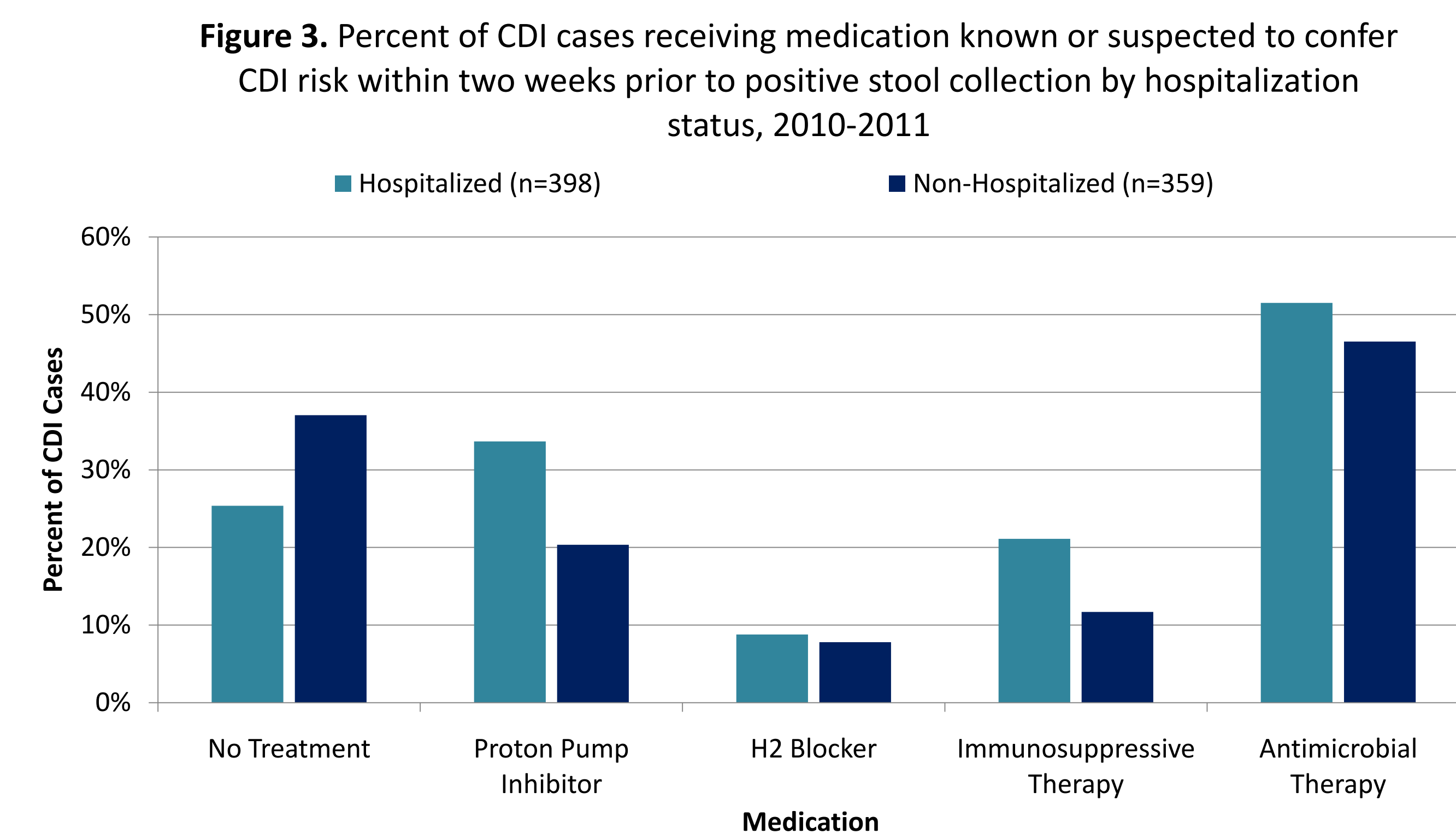
## Results



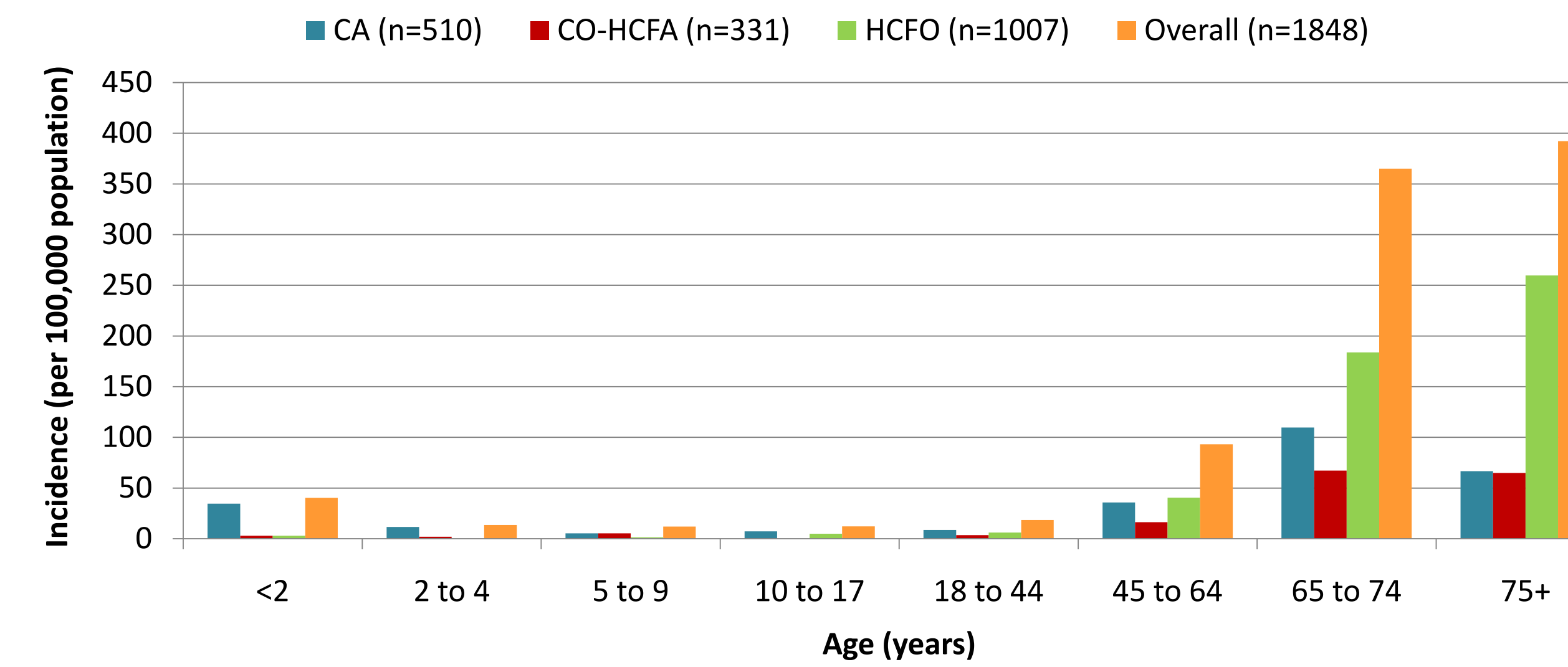
**Table 1. Severity of CDI among Healthcare Facility-Onset and Community-Onset cases in San Francisco, 2010-2011**

	Hospitalized # (%)	Admitted to ICU # (%)	Death # (%)	Recurrent Positive Cdiff^ # (%)	Diarrhea # (%)	White blood cell count ≥15,000/μL # (%)
HCFO* (n=1009)	620 (68)	n/a	n/a	n/a	n/a	n/a
HCFO Sampled** (n=102)	62 (62)	5 (8)	10 (10)	21 (21)	51 (50)	23 (23)
CO Total (n=847)	387 (46)	43 (11)	39 (5)	117 (14)	519 (61)	126 (15)
CA (n=515)	191 (37)	20 (10)	16 (3)	62 (12)	323 (64)	56 (11)
CO-HCFA (n=332)	196 (59)	23 (12)	23 (7)	55 (17)	196 (59)	70 (21)
CO Total + HCFO Sampled** (n=949)	450 (47)	48 (11)	49 (5)	138 (15)	570 (60)	149 (16)
Overall (n=1856)	1070 (58)	n/a	n/a	n/a	n/a	n/a

\*HCFO includes onset in long term care and skilled nursing facilities.  
\*\*1 of 10 HCFO cases were sampled for full case report form completion.  
^An additional positive *C. difficile* test is considered recurrent if occurring within 2-8 weeks of initial positive test.



**Figure 2. Average yearly incidence of CDI in San Francisco by age, 2010-2011**

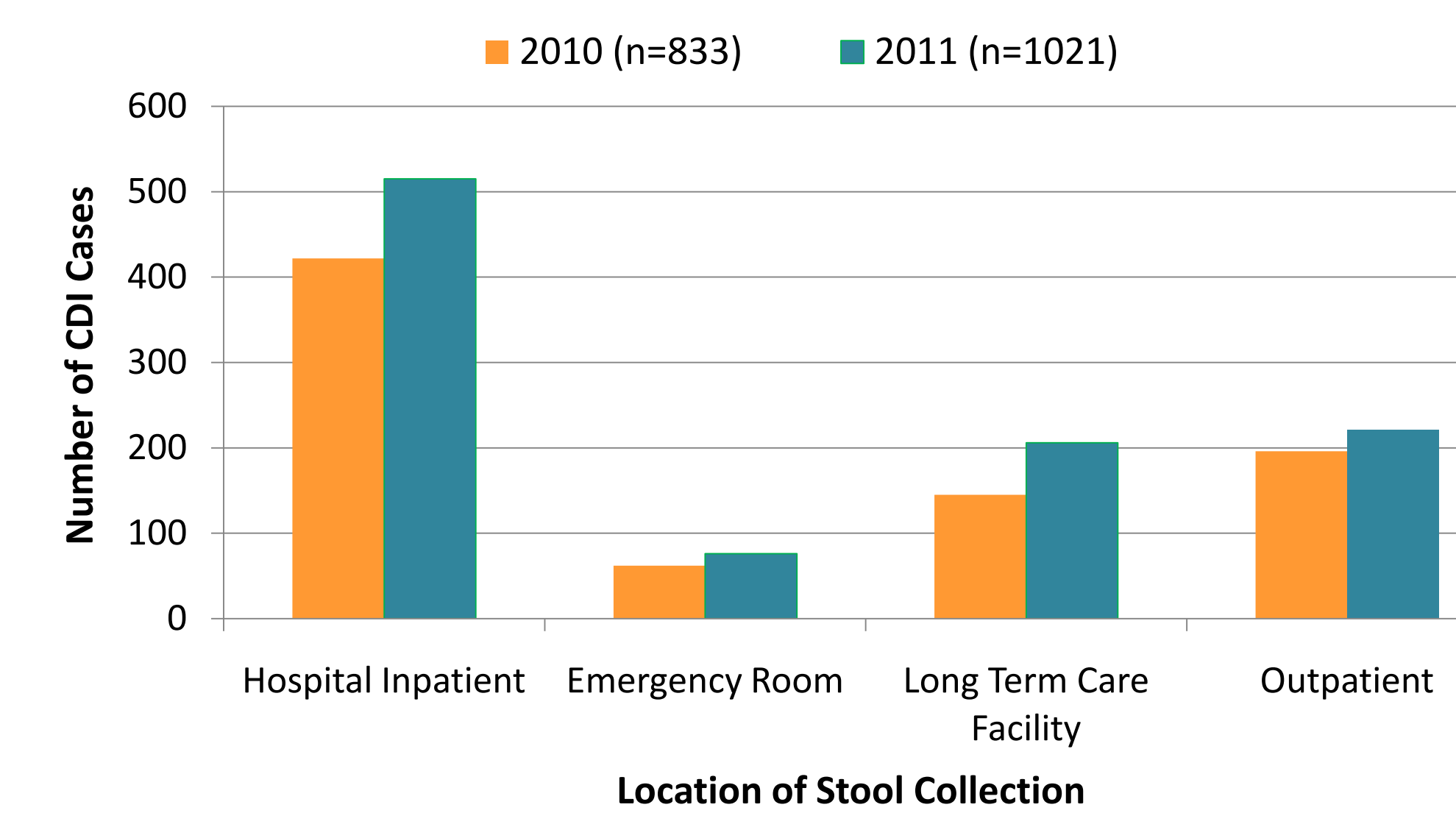


**Table 2. Severity of CDI cases by epidemiologic class in San Francisco, 2010-2011**

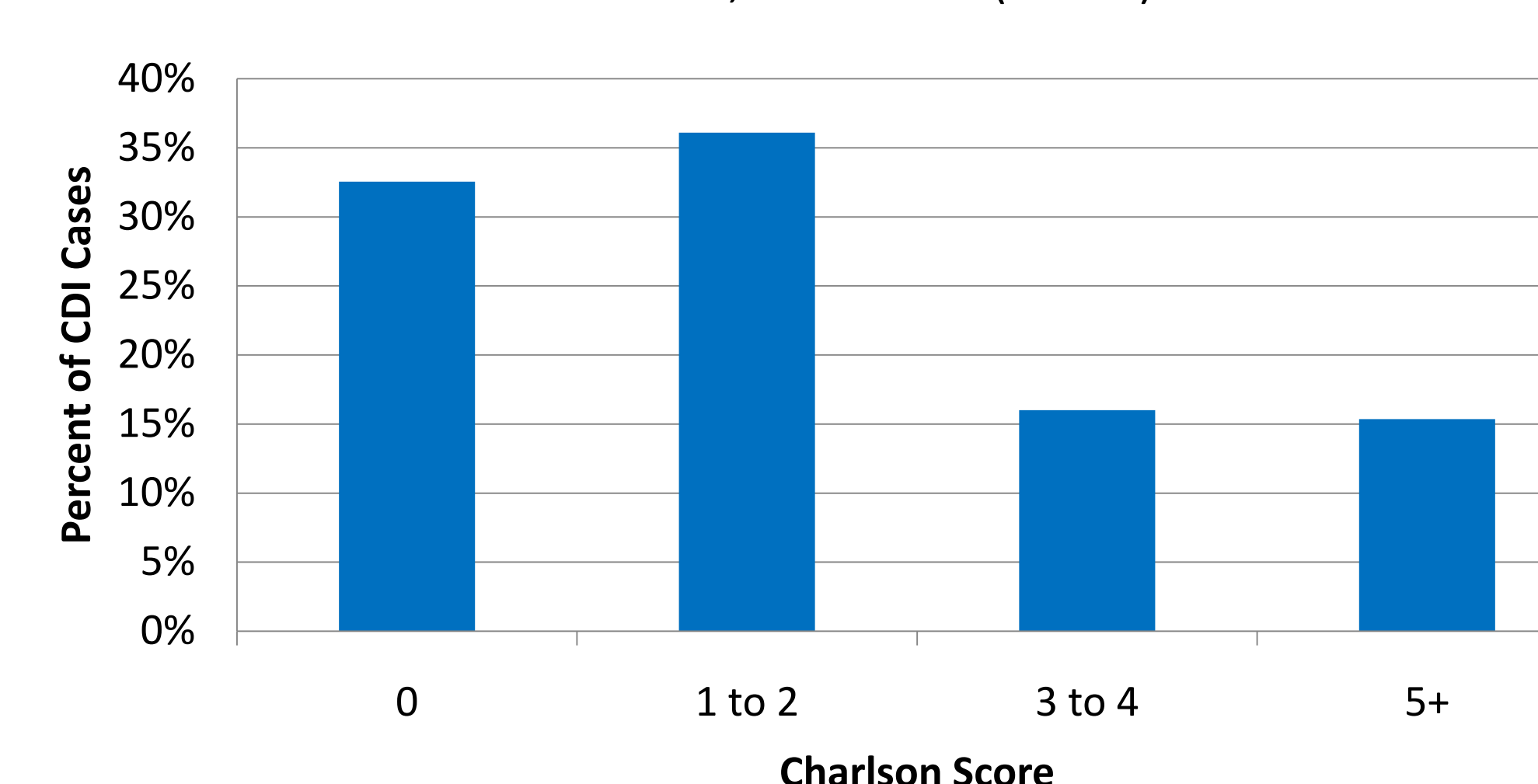
Severity Variable	CA	HCFO Sampled	CO-HCFA		
		OR (95% CI)	p-value	OR (95% CI)	p-value
Diarrhea*	Reference	0.41 (0.25, 0.69)	0.001	0.68 (0.48, 0.99)	0.039
Leukocytosis	Reference	1.79 (1.00, 3.20)	0.047	1.84 (1.22, 2.78)	0.003
Recurrence**	Reference	1.88 (1.09, 3.26)	0.022	1.44 (0.97, 2.13)	0.067
Death	Reference	3.39 (1.49, 7.72)	0.002	2.26 (1.18, 4.35)	0.012

\*Measured ± 1 day of positive test.  
\*\*An additional positive *C. difficile* test is considered recurrent if occurring within 2-8 weeks of initial positive test.

**Figure 4. Stool collection by facility type, 2010-2011**



**Figure 5. Charlson Comorbidity Index (excluding age) among CDI cases, 2010-2011 (n=762)**



## Results

- Over a two-year period (2010-2011), 1,867 incident CDI cases were identified. Annual incidence of CDI in San Francisco County was 102.2 cases per 100,000 persons in 2010 and 125.4 cases per 100,000 persons in 2011. (Figure 1)
- Incidence of CDI increased with age, the highest incidence being in those 75 years and older (392.2 cases per 100,000 persons). (Figure 2)
- Table 1 describes the severity of CDI among case classes. Of incident cases, 1,070 (58%) were hospitalized at the time of stool collection. Complete chart review revealed leukocytosis (white blood cell count ≥15,000/μL) in 16% (n=149) of cases and documented diarrhea in 60% (n=570) of cases.
- The odds of diarrhea were significant in HCFO Sampled and CO-HCFA cases when compared to CA cases (OR 0.41 and 0.68, respectively). The odds of deaths were significant in HCFO Sampled and CO-HCFA cases when compared to CA cases (OR 3.39 and 2.26, respectively). (Table 2)
- The odds of proton pump inhibitor use and immunosuppressive therapy were significant among hospitalized cases when compared to non-hospitalized cases (OR 1.94 and 0.40, respectively). (Figure 3)
- In 2010, 3,738 people were admitted to skilled nursing facilities in San Francisco County. Of this population, 3.9% (n=145) had CDI, compared to 0.1% of the overall San Francisco population. (Figure 4)
- Forty-one cases did not exhibit any of the traditional risk factors of older age (>65 years), comorbidities, or exposures to health care or medications in the 12 weeks prior to stool collection.
- The Charlson Comorbidity Index is a weighted scale of 19 diseases, weighted from 1 to 6. A total score for each case is calculated and predicts mortality risk over a period of a few weeks to ten years. Using this measure, Figure 5 illustrates the comorbidity score distribution among 2010 and 2011 cases. Among CDI cases, the most common underlying conditions were diabetes (n=156), chronic renal insufficiency (n=138), chronic obstructive pulmonary disease (n=99) and congestive heart failure (n=93).

## Conclusions

- CDI is relatively common in San Francisco County and a high proportion of cases are occurring outside of healthcare settings. Traditional risk factors such as hospitalization, older age and antibiotics, while prevalent, do not account for all cases.
- Further evaluation of emerging risk factors and estimates of population-based incidence are needed.

## Limitations

- Despite comprehensive case follow-up, completeness of outpatient charts varies among providers. As such, the quality of data, especially antimicrobial use, may be affected.
- While the HCFO class represents the majority of cases, the sampling scheme (1:10) limits the number of complete cases abstracted.