California Norovirus Laboratory Network (NLN)
Triannual Report for June through September 2018
AND
2017-2018 Norovirus Season Summary

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Viral and Rickettsial Disease Laboratory (VRDL)
Respiratory and Gastroenteric Diseases Section
Alice Chen, Thalia Huynh, Chao-Yang Pan, Tasha Padilla, and Debra A. Wadford

CONTENTS

INTRODUCTION

This is the third triannual report issued by the VRDL to inform NLN member laboratories and California local health departments and partners about current norovirus-relevant topics, particularly about circulating and emerging strains detected from California outbreaks of acute viral gastroenteritis tested by NLN labs. This issue also includes a 2017-2018 Norovirus Season Summary. In addition to norovirus, this report includes information about norovirus-negative gastroenteritis outbreaks characterized by the VRDL, including rotavirus, sapovirus, astrovirus, and gastroenteric adenoviruses 40 and 41. Outbreaks herein are defined as being two or more cases of acute gastroenteritis linked by time, person, and place. Laboratory-confirmed outbreaks are those in which a gastroenteric viral agent has been detected by a laboratory method (e.g., PCR) from two or more outbreak patient specimens.

NOROVIRUS ACTIVITY, JUNE THROUGH SEPTEMBER 2018

From June through September 2018, the NLN reported 19 suspected norovirus outbreaks to VRDL. Of the 19 suspected outbreaks, 12 (63%) were confirmed by real-time RT-PCR (Table 1, Figure 1). Los Angeles County reported the most confirmed outbreaks with three, followed by Orange County with two (Figure 2). As shown in Table 1, more outbreaks were associated with Genogroup II (GII) viruses (9/12, 75%) than with Genogroup I (GI) viruses (3/12, 25%), although the total number of outbreaks was low. Of the 9 GII outbreaks reported by the NLN from June through September 2018, 8 outbreaks (89%) were genotyped. The predominant genotype identified was **GII.P16-GII.4 Sydney** (3/9, 33%), as shown in Table 2. Last season, from June through September 2017, the most commonly detected genotype was **GII.P16-GII.2,** identified in 7 (44%) of 16 outbreaks genotyped by VRDL. Norovirus GII.P16-GII.2 was associated with several large outbreaks at schools throughout California during May 2017.

Long-term care facilities (LTCFs) are settings where specimens are more easily obtained for laboratory confirmation of suspect norovirus outbreaks than in other settings (such as schools or restaurants). There were 7 confirmed LTCF outbreaks out of the 12 confirmed norovirus outbreaks reported by NLN labs from June through September 2018. Due to more available

specimens, more outbreaks at LTCFs were genotyped than for any other setting (5 of the 9 genotyped norovirus outbreaks from June through September 2018 originated from LTCFs, as shown in Figure 3).

ORANGE COUNTY ROTAVIRUS OUTBREAK — APRIL 2018

Norovirus-negative gastroenteritis outbreaks may be further tested by VRDL for four other gastroenteric viruses: rotavirus, astrovirus, sapovirus, and gastroenteric adenoviruses 40 and 41. In April 2018, Orange County Public Health Laboratory submitted specimens to VRDL from a long-term care facility norovirus-negative gastroenteritis outbreak. VRDL detected rotavirus by real-time RT-PCR in 3 of 5 patient specimens from this outbreak. The rotavirus-positive specimens were then forwarded to CDC for typing. We encourage our NLN partners to submit norovirus-negative outbreaks to VRDL for further testing.

Table 1: Norovirus Testing Reported by the NLN, June—September 2018

Month	Total Outbreaks	Positive Outbreaks	Total Specimens	Positive Specimens	GI OB	GII OB
June	4	3	14	8	0	3
July	2	1	7	3	0	1
August	9	5	33	12	1	4
September	4	3	44	10	2	1
Total	**19**	**12**	**98**	**33**	**3**	**9**

Table 2: Norovirus Genotypes Identified* from Reported Norovirus Outbreaks, June—September 2018 (N = 9)

Genogroup I Genotypes	**Number of OBs**
GI.P6-GI.6	1
Total	**1**
Genogroup II Genotypes	**Number of OBs**
GII.P7-GII.7	2
GII.P16-GII.12	2
GII.P17-GII.17	1
GII.P16-GII.4 Sydney *(aka "GII.4 Sydney 2015", currently the predominant circulating norovirus variant)*	3
Total	**8**

***Please note that VRDL is not able to genotype every OB

Figure 1: Laboratory-Confirmed Norovirus Outbreaks Reported by the NLN June — September (2017 vs. 2018)

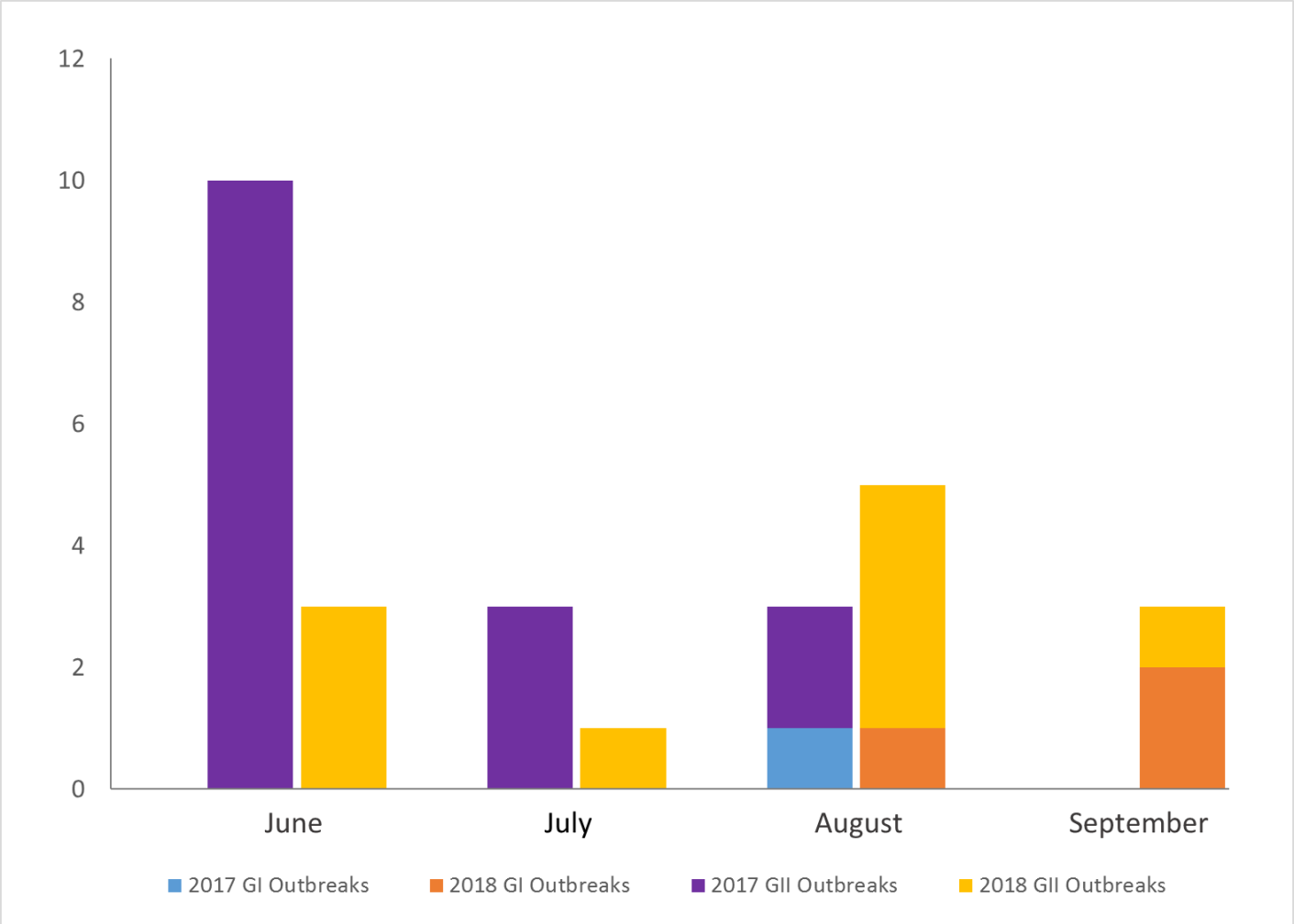


Figure 2: **Number of Laboratory-Confirmed Norovirus Outbreaks Identified by Local Health Jurisdiction from June through September 2018 (N = 12)**

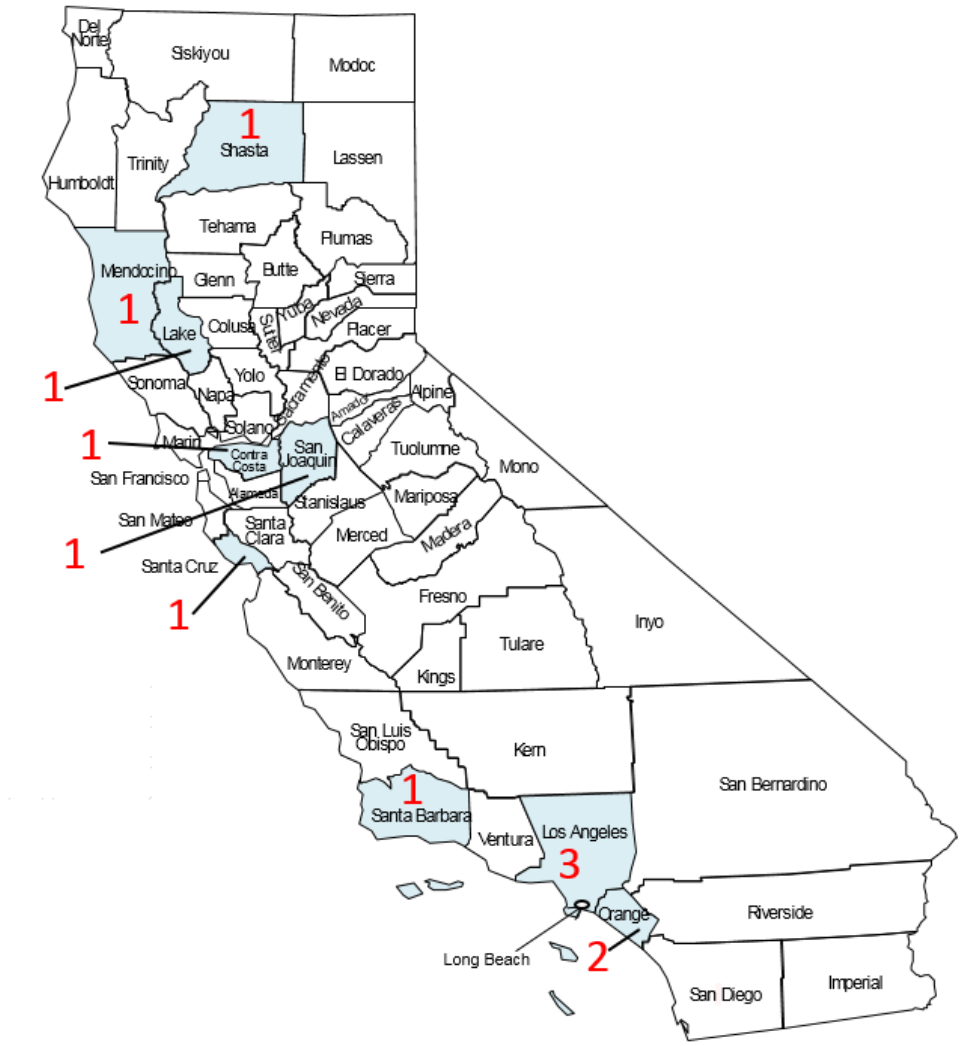
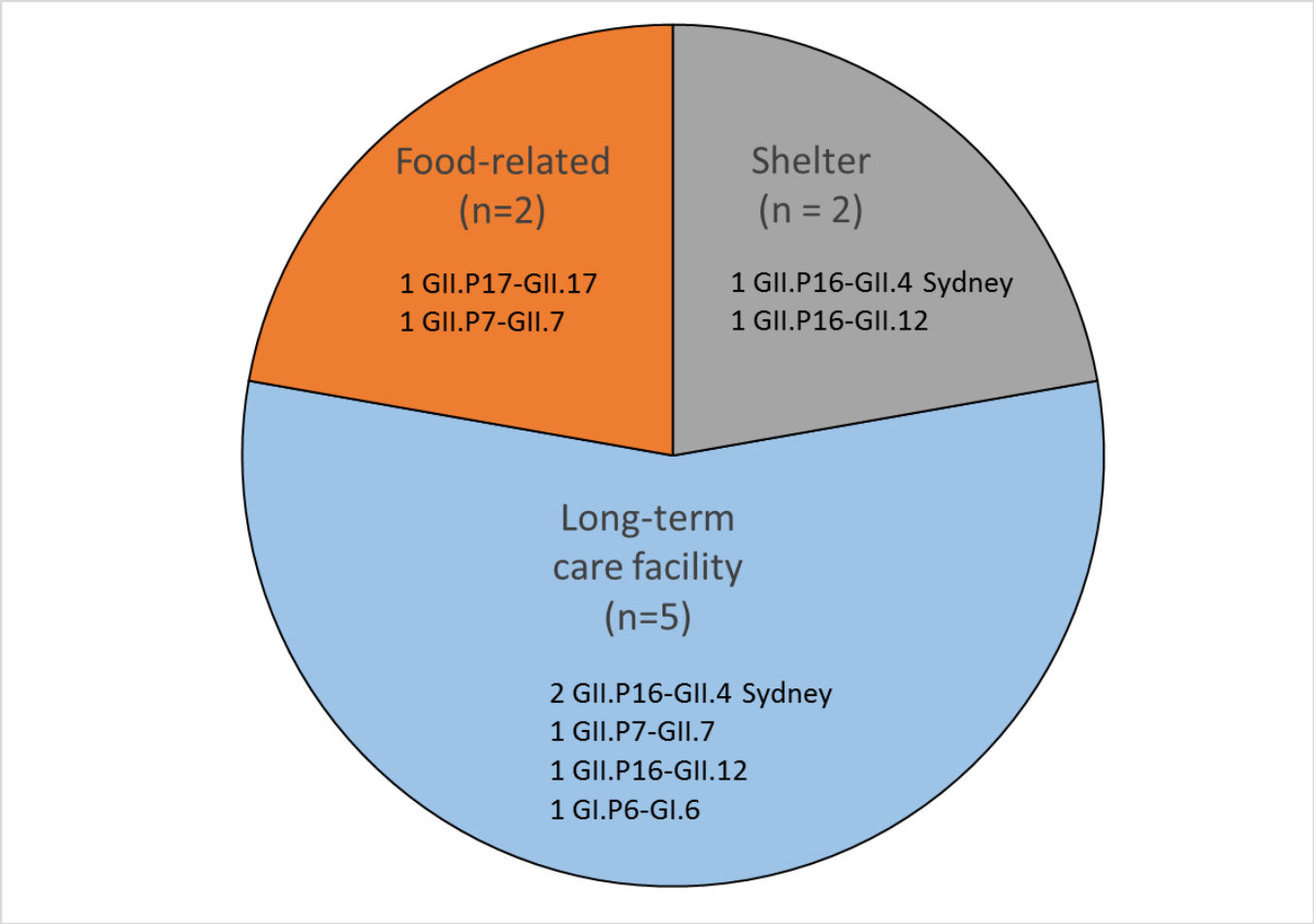


Figure 3: Norovirus Genotypes by Setting for Outbreaks (OBs) Tested by the NLN June — September 2018 (N=9)



NOROVIRUS 2017-2018 SEASON SUMMARY

From October 2017 through September 2018, the NLN reported 147 suspected norovirus outbreaks, of which 108 (73%) were laboratory-confirmed by real-time PCR testing (Table 3), compared to 90 PCR-confirmed outbreaks out of 160 suspected outbreaks (56%) during the 2016-2017 season (data not shown). About 50% (396/785) of outbreak specimens tested were norovirus positive. As shown in Table 3, outbreaks were overwhelmingly caused by Genogroup II (GII) viruses (97/108, 90%). Los Angeles County reported the most confirmed outbreaks with 23, followed by Orange County with 10 (Table 4, Figure 4).

A total of 72 laboratory-confirmed norovirus outbreaks reported by the NLN during October 2017 through September 2018 were genotyped (Table 5). The predominant genotype identified throughout this time period was **GII.P16-GII.4 Sydney** (35/72, 49%), as shown in Figure 5.

Overall, the majority of confirmed norovirus outbreaks (78/108, 72%) reported from October 2017 through September 2018 occurred at LTCFs. In comparison, 11% of outbreaks were foodborne (12 out of 108 outbreaks) and 6% were from school settings (7 out of 108 outbreaks).

REMINDERS

1. Please send a minimum of **TWO positive stool specimens and their nucleic acid extracts per outbreak** to VRDL for norovirus genotyping; **more than TWO is preferred**. Please submit one specimen and its corresponding nucleic acid extract per patient.
2. Please submit norovirus-negative outbreak specimens (defined as at least three norovirus-negative specimens) to VRDL for further testing.
3. Please provide CalREDIE identifiers whenever possible. VRDL will provide, upon request, real-time RT-PCR primers and probe and controls.
4. VRDL requires the **VRDL General Purpose Laboratory Submittal Form** for all specimens. Please include a Gastroenteritis Outbreak Information Summary Form with the individual VRDL Submission forms. Please refer to the "NOROVIRUS TESTING QUICK SHEET" on the VRDL's website for further instructions. All necessary VRDL forms can be found at:

https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/VRDL_Specimen_Submittal_Forms.aspx

5. VRDL can perform norovirus PCR testing if your laboratory lacks the resources. Please work with your environmental health colleagues, epidemiologists, and health officers to promote laboratory investigation of suspect acute viral gastroenteritis outbreaks.
6. Please contact Chao Pan if you require technical support: Chao-Yang.Pan@cdph.ca.gov
7. Please send your jurisdiction's weekly NLN report to Alice Chen at: Alice.Chen@cdph.ca.gov

Table 3: Norovirus Testing Reported by the NLN Season Summary October 2017 — September 2018

Month	Total # Gastroenteric Outbreaks Tested	Norovirus Positive Outbreaks Identified	Total # Specimens Tested	Number of Positive Specimens Identified	GI Outbreaks	GII Outbreaks
October	4	4	33	14	1	3
November	15	10	106	50	0	10
December	33	24	210	99	3	21
January	30	21	117	60	2	19
February	17	17	66	48	0	17
March	9	8	55	49	1	7
April	12	8	67	31	1	7
May	8	4	33	12	0	4
June	4	3	14	8	0	3
July	2	1	7	3	0	1
August	9	5	33	12	1	4
September	4	3	44	10	2	1
Total	**147**	**108**	**785**	**396**	**11 (10%)**	**97 (90%)**

Table 4: Season Summary of Norovirus Outbreaks (OBs)
October 2017 — September 2018

NLN Local Health Jurisdiction	Total Suspect Norovirus OBs Reported by Lab	Total Laboratory-Confirmed Norovirus OBs
Alameda	6	5
Butte	1	1
Contra Costa	7	6
Fresno (rejoined 2018)	0	0
Humboldt	1	1
Long Beach	1	1
Los Angeles	43	23
Monterey	1	1
Napa-Solano-Yolo-Marin	2	1
Orange	11	10
Riverside	7	7
Sacramento	10	6
San Bernardino	0	0
San Diego	12	9
San Joaquin	3	1
San Luis Obispo	3	2
San Mateo	5	4
Santa Barbara	4	3
Santa Clara	8	7
Shasta	4	4
Sonoma (for Lake and Mendocino counties)	2	2
Stanislaus	0	0
Tulare	8	7
Ventura	5	4
VRDL (for Nevada and Santa Cruz counties)	3	3
Total	**147**	**108**

Table 5: Season Summary of Norovirus Genotypes* from Reported Norovirus Outbreaks: October 2017 through September 2018 (N = 72)

Genogroup I Genotypes	**Number of OBs**
GI.P6-GI.6	2
GI.P7-GI.7	2
GI.P4-GI.4	2
Total	**6**
Genogroup II Genotypes	**Number of OBs**
GII.Pe-GII.4 Sydney	5
GII.Pg-GII.1	2
GII.P4 New Orleans-GII.4 Sydney	4
GII.P7-GII.6	1
GII.P7-GII.7	3
GII.P7-GII.14	1
GII.P12-GII.3	4
GII.P16-GII.1	1
GII.P16-GII.2	6
GII.P16-GII.12	2
GII.P17-GII.17	2
GII.P16-GII.4 Sydney *(aka "GII.4 Sydney 2015", currently the predominant circulating norovirus variant [Figure 5])*	35
Total	**66**

***Please note that VRDL is not able to genotype every OB

Figure 4: **Season Summary of Laboratory-Confirmed Norovirus Outbreaks Identified by Local Health Jurisdiction from October 2017 through September 2018 (N = 108)**

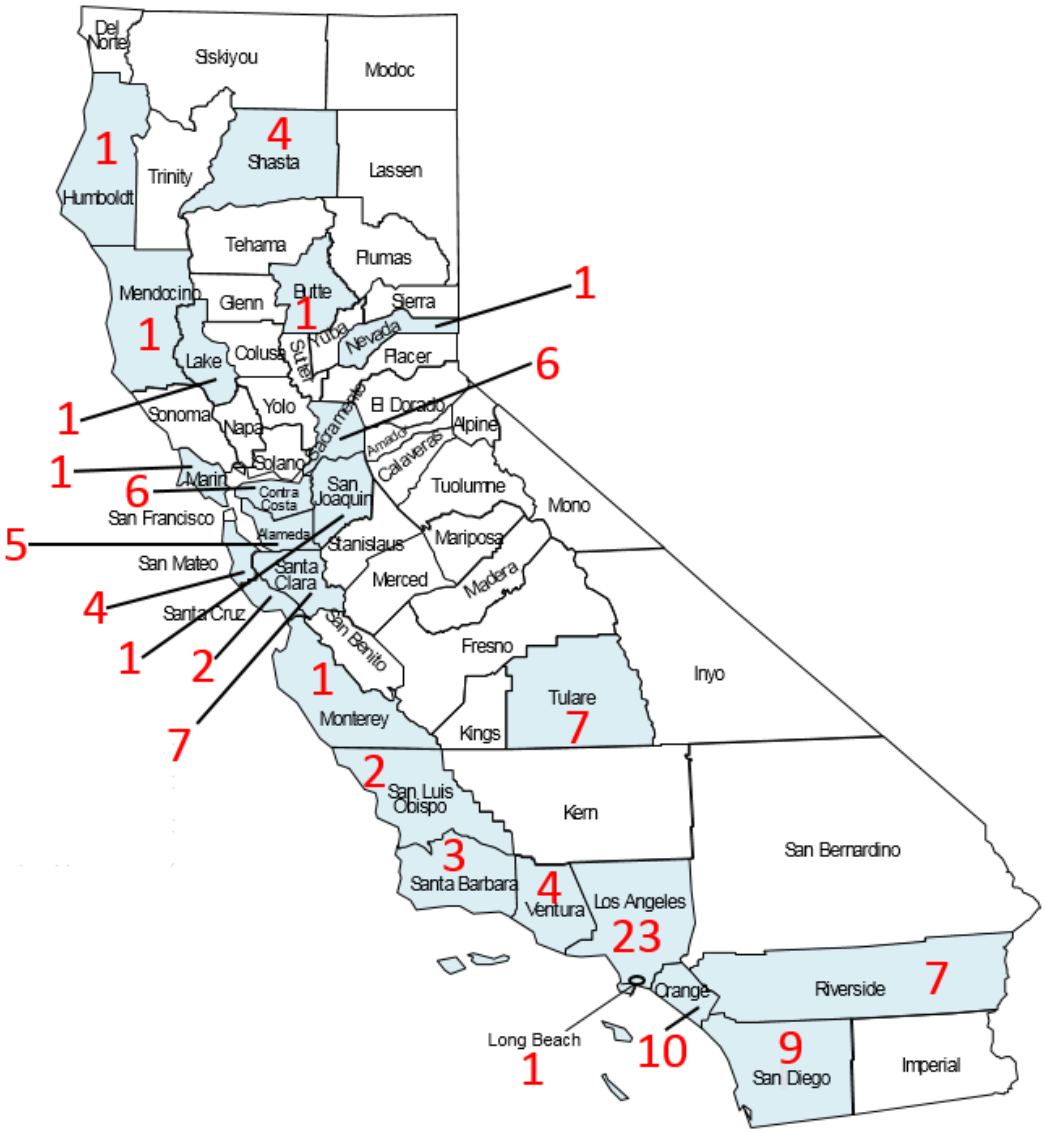


Figure 5: Season Summary of Norovirus Genotypes from October 2017 through September 2018 (N=72)