Monitoring and Reporting Violations

Doug Owen
TWG Representative
TCRDS Federal Advisory Committee
December 5, 2007

This Meeting's Presentations

Objectives

Provisions

System compliance

Improvement

Research

TCR Compliance Analysis

Presentation Objectives

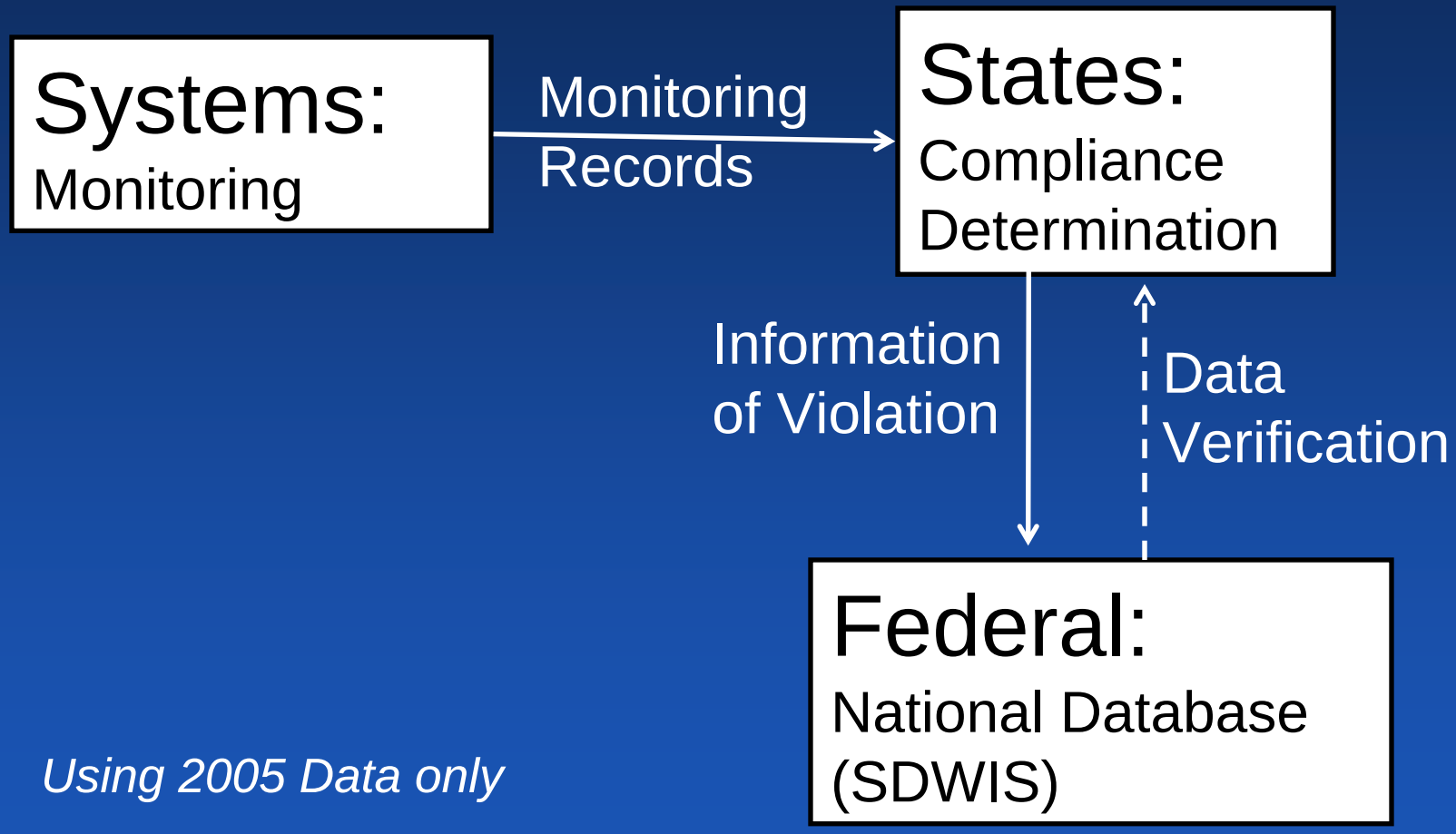
- Questions regarding compliance:
  - How well are systems complying with the TCR?
  - What types of systems are having problems with compliance?
  - Differences in violation rates between states
  - What else can we learn from the M/R compliance information?

  - Results from data analysis are summarized in the main presentation to address each of these questions
  - Detailed results are included in Appendices
  - Monitoring and reporting violations can not be analyzed separately because they were not documented separately

Background about M&R Violations

- Monitoring and Reporting violations inform completeness of MCL violation data
- Different categories of M&R violations track different components of the rule (e.g. routine, repeat samples)
- M&R violations require Tier III public notification

Information Collection Process



Using 2005 Data only

Definitions

- Major Routine MR Violation
  - Failure to report or take any of the required routine samples in a compliance period
- Minor Routine MR Violation
  - Failure to report or take some of the required routine samples in a compliance period
- Major Repeat MR Violations
  - Failure to report or take any of the follow up repeat monitoring after a TC-positive sample
- Minor Repeat MR Violations
  - Failure to report or take some of the follow up repeat monitoring after a TC-positive sample

Summary of M&R Violations for All System Types and Sizes

Monitoring & Reporting Violation Types	Number of Systems With at Least One Violation	Number of Systems With More Than One Violation*
Major Routine	16,450 (11%)	4,940 (3%)
Major Repeat	1,628 (1%)	103 (0.1%)
Minor Routine	1,962 (1%)	239 (0.2%)
Minor Repeat	540 (0.4%)	26 (0.02%)

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included

** Most have two violations in a year*

Major Routine M/R Violation by System Type

			Systems with More Than One Violation	
System Type	Systems with No Violation	Systems with One Violation	Number of Systems	Mean Number Violations Per System
CWS	46,268 (93%)	2,544 (5%)	1,026 (2%)	3.6
NTNCWS	16,286 (91%)	1,227 (7%)	360 (2%)	2.8
TNCWS	71532 (86%)	7,739 (9%)	3,554 (4%)	2.8
All	133,086 (89%)	11,510 (8%)	4,940 (3%)	3

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included

What types of systems are having problems with compliance?

- Major Routine Violation by System Type; at least one violation in 2005:
  - 11,293 (14%) of TNCWS
  - 1,587 (9%) of NTNCWS
  - 3,570 (7%) of CWS
- Major Routine Violation rates vary among systems sizes
  - 12% (15,936) of systems<1,001
  - 4% (419) of systems @ 1,001-4,100
  - 1% (14) of systems >33,001
- Other M&R Violations:
  - Major and Minor Repeat violation rates varied little between system types and sizes
  - Minor Routine violations are more common in systems taking more samples

Differences in violation rates between states?

- MR violation rates differ by more than 10 fold across States for both Major Routine and Repeat
  - By system types and size (<1000 vs >1000)
- See Appendix 3 for State specific data

Insights into M&R Violations from Data Verification Process

- Data Verification compares State databases to SDWIS and identifies violations that should have been reported
- Shows that SDWIS data is about 50% complete for M&R violations
- Identifies categories of reasons for missing SDWIS violations:
  - All samples were taken on the same day rather than different days within a month (required for systems taking >5 samples)
  - Delayed report
  - Other practices different from TCR requirements
- Could explain some of the variation in State M&R violation rates

Appendices for M&R Presentation

1. System Inventory Information in 2005
   - By System category
2. Year Trend of M/R Violations
   - By System category
3. M/R Violations by States
4. Detailed Results from Analysis of M&R Violations
5. Analysis of Data from Data Verification; Potential Influences of M&R Violations on MCL Violations

Appendix 4

Major Repeat M/R Violation by System Type

System Type	Systems with No Violation	Systems with One Violation	Systems with Multiple Violations	
			Number of Systems	Mean Number Violations Per System
CWS	49,385 (99.09)	416 (0.83%)	37 (0.07%)	2.1
NTNCWS	17,769 (99.42%)	94 (0.53%)	10 (0.06%)	2.4
TNCWS	82,027 (99.04%)	742 (0.90%)	56 (0.07%)	2.2
All	148,181 (99.09%)	1,252 (0.84%)	103 (0.07%)	2.2

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included

Appendix 4

Major M/R Violations by CWS System Size

System Size	Routine		Repeat	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
<=1,000	3,184	9.44%	368	1.09%
1,001-4,100	299	3.35%	35	0.39%
4,100-33,000	73	1.25%	40	0.68%
33,001-100,000	11	1.14%	4	0.41%
>100,000	3	0.81%	6	1.62%

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included.
Those systems with unknown source water type are not included.

Appendix 4

Major M/R Violations by NCWS System Size

System Size	Routine		Repeat	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
<=1,000	12,752	12.87%	896	0.90%
1,001-4,100	120	8.25%	5	0.34%
4,100-33,000	8	5.03%	1	0.63%
33,001-100,000	0	0.00%	0	0.00%
>100,000	0	0.00%	0	0.00%

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included.
Those systems with unknown source water type are not included.

Appendix 4

Major M/R Violations by "Conventional" CWS System Size Category

System Size	Routine		Repeat	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
<=500	2,846	10.08%	334	1.18%
501-3,300	617	4.64%	59	0.44%
3,301-10,000	64	1.42%	25	0.56%
10,001-100,000	40	1.17%	29	0.85%
>100,000	3	0.81%	6	1.62%

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included.
Those systems with unknown source water type are not included.

Appendix 4

Major M/R Violations by "Conventional" NCWS System Size Category

System Size	Routine		Repeat	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
<=500	12,387	12.98%	869	0.91%
501-3,300	481	9.53%	32	0.63%
3,301-10,000	10	5.08%	1	0.51%
10,001-100,000	2	5.13%	0	0.00%
>100,000	0	0.00%	0	0.00%

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included.
Those systems with unknown source water type are not included.

Appendix 4

Major M/R Violations by System Type among Systems <1001

System Type	Routine		Repeat	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
CWS	3,184	9.44%	368	1.09%
NTNCWS	1,536	9.02%	103	0.60%
TNCWS	11,216	13.67%	793	0.97%
All	15,936	12.00%	1,264	0.95%

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included.

Appendix 4

Minor Routine M/R Violation by System Type

			Systems with More Than One Violations	
System Type	Systems with No Violation	Systems with One Violation	Number of Systems	Mean Number Violations Per System
CWS	48,712 (97.74%)	978 (1.96%)	148 (0.30%)	2.5
NTNCWS	17,726 (99.18%)	125 (0.70%)	22 (0.12%)	2.6
TNCWS	82,136 (99.17%)	620 (0.75%)	69 (0.08%)	2.3
All	147,574 (98.69%)	1,723 (1.15%)	239 (0.16%)	2.5

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included

Appendix 4

Minor Repeat M/R Violation by System Type

System Type	Systems with No Violation	Systems with One Violation	Systems with Multiple Violations	
			Number of Systems	Mean Number Violations Per System
CWS	49,627 (99.58%)	200 (0.40%)	11 (0.02%)	2.1
NTNCWS	17,841 (99.82%)	29 (0.16%)	3 (0.02%)	2.0
TNCWS	82,528 (99.64%)	285 (0.34%)	12 (0.01%)	2.1
All	148,996 (99.64%)	514 (0.34%)	26 (0.02%)	2.1

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included

Minor M/R Violations by CWS System Size

System Size	Routine		Repeat	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
<=1,000	623	1.85%	149	0.44%
1,001-4,100	326	3.66%	23	0.26%
4,100-33,000	155	2.65%	29	0.50%
33,001-100,000	15	1.55%	4	0.41%
>100,000	7	1.89%	6	1.62%

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included. Those systems with unknown source water type are not included.

Appendix 4

Minor M/R Violations by NCWS and NTNCWS System Size

System Size	Routine		Repeat	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
<=1,000	763	0.77%	320	0.32%
1,001-4,100	65	4.47%	8	0.55%
4,100-33,000	8	5.03%	1	0.63%
33,001-100,000	0	0.00%	0	0.00%
>100,000	0	0.00%	0	0.00%

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included. Those systems with unknown source water type are not included.

Appendix 4

Minor M/R Violations by "Conventional" CWS System Size Category

System Size	Routine		Repeat	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
<=500	524	1.86%	133	0.47%
501-3,300	390	2.93%	36	0.27%
3,301-10,000	127	2.82%	18	0.40%
10,001-100,000	78	2.28%	18	0.53%
>100,000	7	1.89%	6	1.62%

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included.
Those systems with unknown source water type are not included.

Appendix 4

Minor M/R Violations by "Conventional" NCWS System Size Category

System Size	Routine		Repeat	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
<=500	727	0.76%	301	0.32%
501-3,300	99	1.96%	26	0.52%
3,301-10,000	10	5.08%	2	1.02%
10,001-100,000	2	5.13%	0	0.00%
>100,000	0	0.00%	0	0.00%

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included.
Those systems with unknown source water type are not included.

Appendix 4

Minor M/R Violations by System Type among Systems <1001

System Type	Routine		Repeat	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
CWS	623	1.85%	149	0.44%
NTNCWS	113	0.66%	28	0.16%
TNCWS	650	0.79%	292	0.36%
All	1,386	1.04%	469	0.35%

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included. Those systems with unknown source water type are not included.

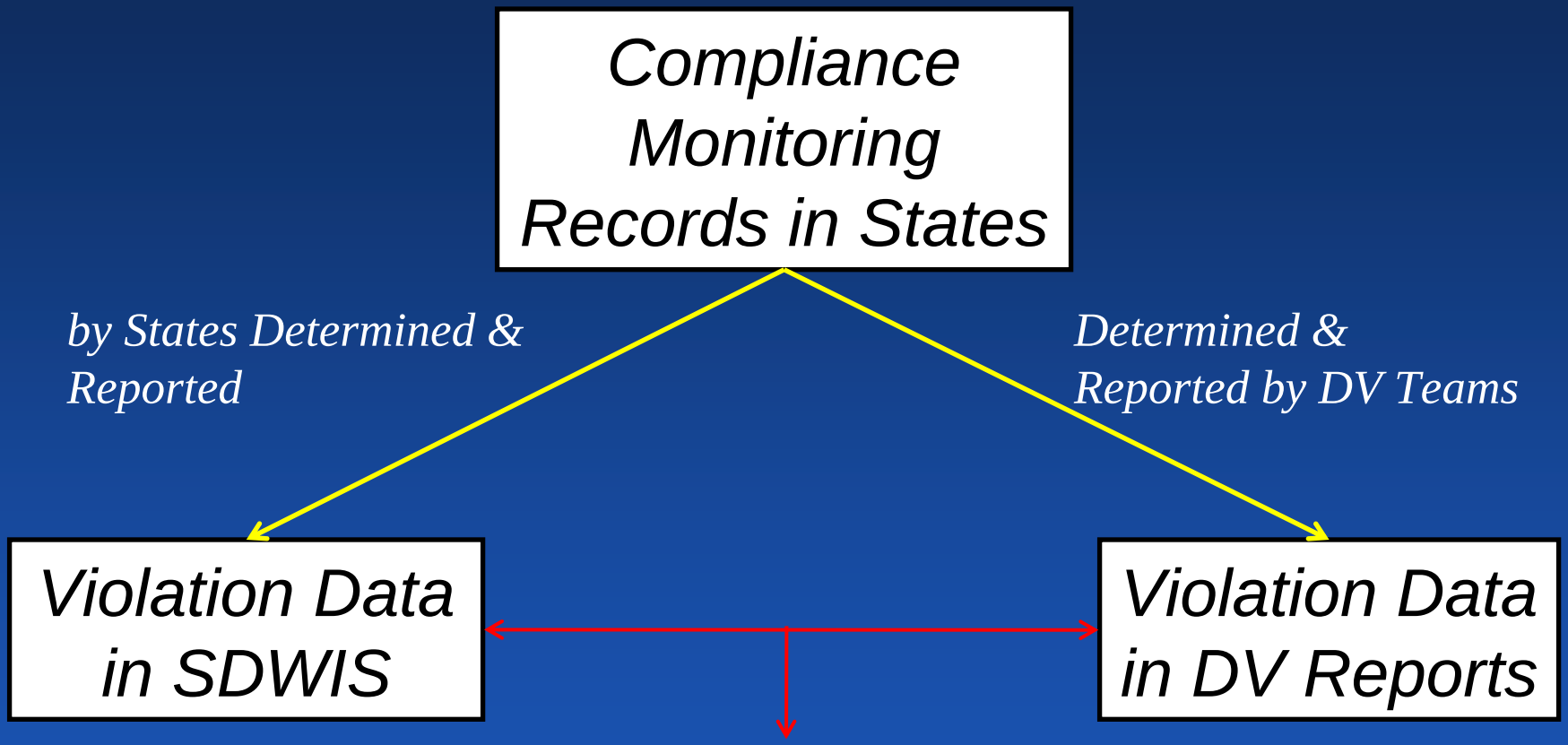
Appendix 4

Major M/R Violation Rates by System Size

System Size	Routines		Repeats	
	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation	# of Systems Having at Least One Violation	% of Systems Having at Least One Violation
<=1,000	15,936	12.00%	1,264	0.95%
1,001-4,100	419	4.04%	40	0.39%
4,100-33,000	81	1.35%	41	0.68%
33,001-100,000	11	1.12%	4	0.41%
>100,000	3	0.80%	6	1.60%

Appendix 5

Data Verification Process



Differences define quality of the data in SDWIS (Completeness & Accuracy)

Appendix 5

Data Verification of SDWIS Completeness and Accuracy Overview (For TWG only)

Completeness (%C)= ID'd violations FED / all violations ID'd by DV
= (v - mf)/v

Accuracy (%A) = correct records / all records = ok/(ok+ef+ov)

v: V should be in FED (v=ok+ef+mf)
e: Errors (e=ef+mf+ov)
ok: State=Fed
ef: Errors in FED
mf: Missing from FED
ov: Over-reported

Appendix 5

Data Quality by System Size

System Size	MCL		M/R	
	%Complete	%Accurate	%Complete	%Accurate
<=1,000	78.50% 314/400	93.03% 307/330	57.5% 1053/1832	90.92% 1031/1134
1,001-4,100	85.11% 40/47	97.56% 40/41	46.8% 87/186	81.63% 80/98
4,100-33,000	83.72% 36/43	89.74% 35/39	23.8% 41/172	93.18% 41/44
33,001-100,000	66.67% 2/3	100.00% 2/2	30.4% 7/23	66.67% 6/9
>100,000	100.00% 3/3	100.00% 3/3	40.0% 6/15	55.56% 5/9

Appendix 5

Potential Influence of M/R Data on MCL Violation Rates

- Next three slides explore this issue for small systems (serving < 1001).

- Using nonacute MCL violation as an example
- Similar kind of calculations could be applied to other sizes and different types of systems and for other types of violation

Appendix 5

What If Calculations

- Adjusted the data to include:
  - Cases where samples were not distributed throughout the month (samples all collected early in the month)
  - Cases where a report of results was delayed or had minor errors.

Appendix 5

Basic Information for Small Systems

Per SDWIS:

- 5,690 small systems (4.28% of systems serving < 1001) had at least one nonacute MCL violations in 2005.
- 16,000 (12% of these systems) had major routine M/R violations in 2005

But, per DV audits:

- The SDWIS MCL violations are 79% complete and 93% accurate.
- The SDWIS M/R violations are 62% complete and 91% accurate.

What if…

…the missing monitoring data showed the same rate of MCL violations as the existing data?

- Adjusting for SDWIS completeness (but not for missing monitoring data), the number of nonacute MCL violations would be 5,690*0.93/0.79 = 6,698
- The % of small systems with nonacute MCL violations would only have increased from 4.28% to 5.04%.

What if …

…each of these Major Routine M/R violations represents an nonacute MCL violation?

- Adjusting for SDWIS completeness and accuracy, the number of Major Routine M/R violations would be 16,000*0.91/0.62 = 23,500
- If each of these Major Routine M/R violations represents an nonacute MCL violation, then the number of nonacute MCL violations would increase from 5,690 to 29190 (23,500+5,690), which is about 21.96% of small systems

Potential Influence of M/R Data on MCL Violation Rates

Appendix 5

- 4.28% nonacute violation rate (having at least one violation in 2005) reported in SDWIS for systems<1,001
- The percentage could be
  - 5.00%, considering completeness and accuracy of MCL violation data in SDWIS
  - 21.96%, considering major routine monitoring and reporting violations (assuming MR violation leads to an additional nonacute violation)
    - A factor of about 5 is estimated

Appendix 5

What else can we learn from the compliance information?

Potential Influence of M/R Data on MCL Violation Rates

For All Systems

	Systems w at Least One Violation		
MCL Violation Types	SDWIS Data (Without Any Adjustment)	Adjustment only with DV Data	Adjustment with DV Data and M/R Violation Data
Nonacute	6,447 (4.31%)	6,850 (4.58%)	32,235 (21.6%)
Acute	598 (0.40%)	635 (0.42%)	2,990 (2.0%)

Note: Based on the data in 2005. State of Ohio, Tribes, and Territories are not included