

# Providing Mailing Cost Reimbursements: The Effect on Reporting Timeliness of Sexually Transmitted Diseases in Virginia

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## SYNOPSIS

**Objectives.** We investigated the effect of providing mailing cost reimbursements to local health departments on the timeliness of the reporting of sexually transmitted diseases (STDs) in Virginia.

**Methods.** The Division of Disease Prevention, Virginia Department of Health, provided mailing cost reimbursements to 31 Virginia health districts from October 2002 to December 2004. The difference (in days) between the diagnosis date (or date the STD paperwork was initiated) and the date the case/STD report was entered into the STD surveillance database was used in a negative binomial regression model against time (as divided into three periods—before, during, and after reimbursement) to estimate the effect of providing mailing cost reimbursements on reporting timeliness.

**Results.** We observed significant decreases in the number of days between diagnosis and reporting of a case, which were sustained after the reimbursement period ended, in 25 of the 31 health districts included in the analysis. We observed a significant initial decrease (during the reimbursement period) followed by a significant increase in the after-reimbursement phase in one health district. Two health districts had a significant initial decrease, while one health district had a significant decrease in reporting timeliness in the period after reimbursement. Two health districts showed no significant changes in the number of days to report to the central office.

**Conclusion.** Providing reimbursements for mailing costs was statistically associated with improved STD reporting timeliness in almost all of Virginia's health districts. Sustained improvement after the reimbursement period ended is likely indicative of improved local health department reporting habits.

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The first step in the control of any communicable disease is prompt recognition and identification of the disease.<sup>1</sup> From a patient-level perspective, this involves efficient diagnoses and treatment of specific conditions. From a population standpoint, prompt recognition and identification involves accurate and timely dissemination of epidemiologic surveillance data to health providers, and communication among local health departments (LHDs), state health departments, and the Centers for Disease Control and Prevention (CDC).

The effectiveness of public health surveillance—the ongoing, systematic collection, analysis, and interpretation of outcome-specific data essential to the planning, implementation, and evaluation of public health practice—relies on data timeliness that must be closely integrated and monitored.<sup>2</sup>

Reporting timeliness of sexually transmitted disease (STD) data is of vital importance to ensure effective evaluation and control activities of highly prevalent infections. STD reporting includes two primary components: (1) timely reporting of data to and from local, state, and federal public health agencies, and (2) timely data entry into STD surveillance applications. Although mutually exclusive activities, these components should be processed uniformly through

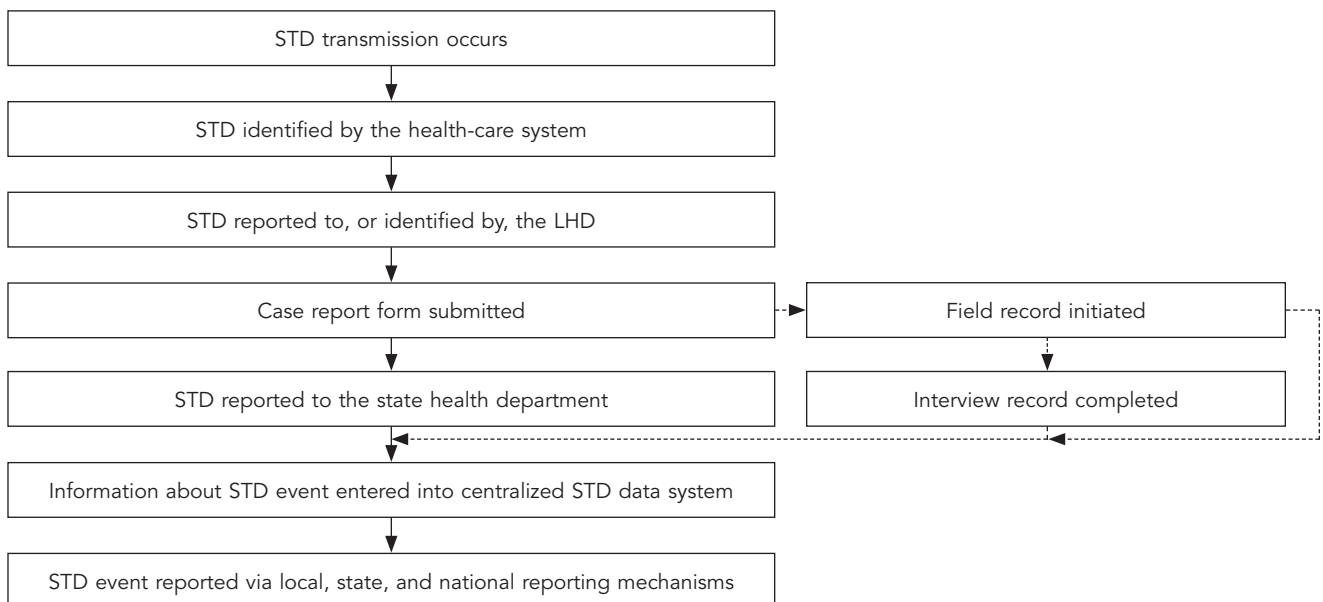
effective data quality management (DQM) to maintain truly useful surveillance data.

The Code of Virginia<sup>3</sup> requires that certain communicable diseases, including numerous STDs, be reported to respective LHDs. The LHD then reports this information to the state offices within the Virginia Department of Health, which transmits relevant nationally reportable disease data to CDC.<sup>4</sup> CDC provides routine feedback on STD data transmissions as a means of assessing data quality and completeness. However, timeliness of disease reporting is challenging and should be undertaken collectively by state and LHD surveillance staff.

Electronic data transmissions, such as improved methods of secured electronic transferability and electronic laboratory records, are currently being reviewed and/or initiated within various Virginia Department of Health program areas. However, STD reporting is, at present, entirely based on paper forms sent through the mail. The sequence of steps that take place to report a condition to the Division of Disease Prevention's (DDP's) STD program are described in Figure 1.

As shown in Figure 1, once an LHD receives information about an STD, the LHD fills out a case report form and sends it to DDP via mail. The case report form contains the patient's information (name, address, and

**Figure 1. Sequence of steps for reporting STDs to the Virginia Department of Health, Division of Disease Prevention**



STD = sexually transmitted disease

LHD = local health department

basic demographics), the reporting provider's name, the disease diagnosis, and the treatment information. The LHD then initiates a field record to follow up with the patient and possible sex partners; the field record is assigned to the disease intervention specialist (DIS) associated with the LHD. The DIS investigates the case and completes an interview record form, which is then sent to DDP. The date on which the interview record is entered into the STD surveillance database is then considered the report date for DDP. The date the field record is closed is the closest approximation to the report date for the field record.

During the late 1990s, DDP worked to institute improvements to its DQM procedures to minimize data-entry backlogs. DDP initiated processes to track receipt of STD mailings from LHDs and to ensure incoming STD data were entered into respective data systems within five days of receipt. Although such procedures improved data timeliness within the state office, they had no impact on LHDs' timeliness in reporting STDs. Thus, DDP attempted to improve the timeliness of STD reporting from LHDs through an incentive program funded by CDC's Outcome Assessment through Systems of Integrated Surveillance cooperative agreement.

We investigated the effect of mailing cost reimbursements provided to LHDs on the timeliness of the LHDs' reporting of STDs in Virginia. To our knowledge, this is the first published account of an incentive-based intervention aimed at improving the timeliness of STD data reporting within the U.S.

## METHODS

Virginia has 35 LHDs organized in 35 health districts.<sup>5,6</sup> Due to lack of sufficient financial and personnel resources, DISs are not physically located in all 35 health districts. As a result, some DISs conduct STD case follow-up activities within geographically adjacent health districts. By default, paperwork submissions from DISs working across district boundaries are mailed from the DISs' home office locations. This cross-jurisdictional DIS effort results in STD mailings being routinely received from only 31 of Virginia's 35 health districts.

In an attempt to improve timeliness of STD reporting, from October 2002 to December 2004, DDP provided mailing cost reimbursements to the 31 health districts that report directly to the central office. DDP staff also tracked the number of STD-related mailings received at the central office from health districts from January 2002 to July 2007. The initial reimbursement amount was \$17.82 per mailing, applied from Octo-

ber to December 2002. The reimbursed amount was changed to \$10 per mailing as of January 2003 and remained unchanged until completion of the incentive program in December 2004. The reimbursement was intended to cover the postage necessary to send the reports through the mail, material needs, and personnel time, and serve as an added incentive to effect procedural change. A mailing was defined as an envelope DDP received from one of the 31 individual health districts that contained at least one of the following: a case report, a field record, or an interview record.

STD cases diagnosed in the private sector comprise the group with the most reporting delays. Therefore, we calculated timeliness of reporting for all STD cases diagnosed by a private provider (private physician, hospital-inpatient care, or urgent care/emergency room) and the associated paperwork (interview records and field records). For a case report, we calculated the difference in days between the case diagnosis date and the date the case was entered into the STD surveillance database at DDP. For interview records, we calculated the difference in days between the date the interview record was assigned and the date it was closed; for field records, we used the difference between the date the field record was initiated and the date it was written.

The initial e-mail communication to inform all health district directors of DDP's intention to provide cost reimbursements for submitting timely morbidity paperwork was sent on November 22, 2002. The e-mail emphasized the need to receive timely and accurate reporting, and explained the reimbursement process. Subsequently, e-mails were sent to LHD directors every quarter specifying the number of mailings received at the central office for the previous quarter and the associated cost reimbursement eligible per health district. Each health district was instructed to send an automated transaction voucher (ATV) or an invoice; a blank ATV template with instructions was attached to each quarterly e-mail.

From October 2002 to December 2004, a total of \$60,456 was made available to health districts based on all mailings received. Of the total amount, \$50,296 was reimbursed via ATVs or invoices, leaving \$10,160 not disseminated due to lack of response to the reimbursement procedure.

We conducted analyses to assess differences in reporting timeliness for each district as measured by the number of days from when a paper record (case, field, or interview record) was initiated until its arrival at DDP (hereafter "lag time"). We analyzed data using negative binomial regression, which accounts for data overdispersion. The outcome variable selected was the

lag time associated with each report. The predictor variable was the reimbursement period, categorized as follows: “before reimbursement,” including data from January 1, 2000, to November 30, 2002; “during reimbursement,” from December 1, 2002, to December 31, 2004; and “after reimbursement,” from January 1, 2005, to June 30, 2007. Even though the health districts were reimbursed retroactively for mailings in October and November 2002, they were not made aware of the project until the end of November 2002; therefore, in our model the reimbursement period begins with December 2002. The model was applied to each individual health district that sent paperwork directly to DDP (31 of the 35 Virginia health districts).

An STD (for the purpose of including all reports associated with it) included the following infections: chlamydia, gonorrhea, and syphilis. Human immunodeficiency virus/acquired immunodeficiency syndrome case-related data were not included in the analyses due to larger reporting delays compared with STDs. The data were analyzed using SAS® version 9.1.3.<sup>7</sup>

## RESULTS

DDP received 222,478 STD case reports between January 2000 and June 2007 from the 31 health districts, which initiated 58,634 field records and 24,182 interview records. The median numbers of days in the reporting lag time at the state level was 42 days before reimbursement, 34 days during reimbursement, and 38 days after reimbursement. At the district level, the median lag time varied from 32–64 days before reimbursement to 28–52 days during and 29–54 days after the reimbursement period ended (Table 1).

Looking further into whether reimbursement had an effect on mailing timeliness, we calculated the number of days that it took the individual health districts to report to the DDP before, during, and after the reimbursement period. Table 1 contains raw median lag times between the paper record being initiated and receipt of the record in the central office for the three time periods (before, during, and after reimbursement). Table 2 represents lag times estimated for each health district using our negative binomial regression model, along with their confidence intervals. The *p*-values indicate the significance of the difference between the estimated lag times for each period of during and after reimbursement compared with the reference level (before reimbursement).

Compared with the before-reimbursement period shown in Table 2, significant decreases in lag time during the reimbursement period, which were sustained after the reimbursement period ended, were

observed in 25 of the 31 health districts included in the analysis. We observed an initial decrease (during the reimbursement period) followed by an increase in the after-reimbursement phase in one of the health districts. One health district initially showed a significant decrease during the reimbursement period, and only one health district showed a significant decrease in the period after reimbursement compared with before reimbursement. Two of the health districts showed no significant changes in the number of days that it took to report to the central office. These trends, derived from the values for the lag time calculated by our model (Table 2), generally mirrored our raw data observations for changes in the median number of days between when a paper record was initiated and when it was received before, during, and after reimbursement (Table 1).

The estimated variations in the number of days to report to the DDP when comparing the before- and after-reimbursement periods ranged from a decrease of 46.8 days in the lag time to report from the Lenowisco health district to an increase of 2.9 days in the Western Tidewater health district. Figure 2 shows the geographic distribution of the observed trends by health district (identified by health district number), with five categories: (1) “decrease” for decreases during reimbursement that were sustained after reimbursement ended; (2) “initial decrease” for decreases during reimbursement that fell back to values comparable to the before-reimbursement period after the reimbursement ended; (3) “initial decrease/final increase” for significant decreases during the reimbursement period compared with the before-reimbursement period as well as a significant increase after the reimbursement period ended compared with the before-reimbursement period; (4) “final decrease” for a considerable decrease after the reimbursement period ended compared with the before-reimbursement period, yet no significant change during the reimbursement period; and (5) “no change” for no statistically significant differences observed among the three periods.

Twenty-five of the 31 health districts were able to establish and maintain significantly improved reporting. Of the other six health districts, where reimbursement was not associated with improvements, three districts established better reporting habits during the reimbursement period but were unable to maintain the improvements after reimbursement ended. One district established better reporting timeliness only after the reimbursement period had ended. Only two health districts did not show significant improvement in reporting timeliness (Piedmont and Mount Rogers), which may be explained by good reporting habits

**Table 1. Raw median number of days to report STDs to the Virginia Department of Health, DDP, by reimbursement period and health district, January 2000–June 2007**

Health district	District number	Number of days to report		
		Before (Jan. 2000–Nov. 2002)	During (Dec. 2002–Dec. 2004)	After (Jan. 2005–June 2007)
		Median	Median	Median
Central Shenandoah	11	41	35	36
Lord Fairfax	12	43	28	35
Rappahannock	13	51	47	41
Rappahannock/Rapidan	14	49	33	35
Thomas Jefferson	15	32	30	30
Alexandria	21	44	36	39
Arlington	22	39	33	34
Fairfax	23	41	35	45
Loudoun	24	50	52	43
Prince William	25	41	32	36
Central Virginia	32	42	40	32
Lenowisco	34	44	37	36
Mount Rogers	35	33	31	35
New River	36	52	32	54
Pittsylvania/Danville	37	38	33	35
Roanoke	38	64	35	29
West Piedmont	39	64	48	45
Chesterfield	41	42	32	36
Crater	42	40	35	33
Hanover	43	53	39	40
Henrico	44	45	35	41
Piedmont	45	35	36	35
Richmond	46	44	28	37
Chesapeake	51	35	29	40
Eastern Shore	52	43	35	37
Hampton	53	38	32	37
Norfolk	54	50	49	45
Peninsula	55	38	31	35
Portsmouth	56	39	37	37
Virginia Beach	58	40	30	36
Western Tidewater	59	34	30	42
Virginia total		42	34	38

STD = sexually transmitted disease

DDP = Division of Disease Prevention

already in place at the start of the observation period, as shown in Tables 1 and 2.

Overall, our model estimated that for Virginia as a whole, reporting timeliness improved by 14.5 days during the reimbursement period. Sustained improvement after reimbursement ended was estimated at 10.7 days when compared with the before-reimbursement period.

## DISCUSSION

To the best of our knowledge, this was the first attempt to increase STD reporting timeliness at the LHD level using financial incentives designed to cover mailing costs. Offering mailing cost reimbursements to health districts to encourage timely disease reporting decreased the reporting lag time associated with submission of STD-related paperwork in 25 of the 31 health districts included in the analysis. Our initial assumption

**Table 2. Estimated number of days to report STDs to the Virginia Department of Health, DDP, by health district, January 2000–June 2007**

Health district	District number	Reimbursement period <sup>a</sup>	Estimate	Lower 95% CI	Upper 95% CI	P-value <sup>b</sup>
Central Shenandoah	11	Before (Ref.)	83.8	78.9	89.0	
		During	60.5	55.8	65.6	<0.0001
		After	53.5	50.5	56.7	<0.0001
Lord Fairfax	12	Before (Ref.)	63.6	59.7	67.7	
		During	45.4	42.6	48.4	<0.0001
		After	46.8	44.3	49.5	<0.0001
Rappahannock	13	Before (Ref.)	73.8	71.0	76.7	
		During	61.5	59.0	64.2	<0.0001
		After	52.7	50.9	54.5	<0.0001
Rappahannock/Rapidan	14	Before (Ref.)	72.1	67.3	77.3	
		During	49.5	45.5	53.8	<0.0001
		After	48.9	45.7	52.2	<0.0001
Thomas Jefferson	15	Before (Ref.)	64.7	62.0	67.4	
		During	50.4	48.0	52.9	<0.0001
		After	44.7	42.8	46.7	<0.0001
Alexandria	21	Before (Ref.)	76.8	73.0	80.8	
		During	50.8	48.0	53.7	<0.0001
		After	57.4	54.7	60.3	<0.0001
Arlington	22	Before (Ref.)	57.6	55.1	60.1	
		During	49.0	46.6	51.6	<0.0001
		After	46.1	44.0	48.3	<0.0001
Fairfax	23	Before (Ref.)	60.2	58.8	61.7	
		During	52.7	51.2	54.3	<0.0001
		After	58.0	56.6	59.5	0.0340
Loudoun	24	Before (Ref.)	66.2	62.0	70.7	
		During	67.6	63.3	72.3	0.6595
		After	56.5	53.7	59.4	0.0002
Prince William	25	Before (Ref.)	56.4	54.8	58.0	
		During	47.8	46.3	49.4	<0.0001
		After	52.6	51.1	54.1	0.0006
Central Virginia	32	Before (Ref.)	64.6	62.3	67.0	
		During	58.3	55.5	61.2	0.0009
		After	45.1	43.3	47.0	<0.0001
Lenowisco	34	Before (Ref.)	90.8	74.5	110.7	
		During	47.5	40.6	55.4	<0.0001
		After	44.0	39.1	49.6	<0.0001
Mount Rogers	35	Before (Ref.)	51.0	44.8	58.0	
		During	57.1	49.9	65.3	0.2339
		After	48.5	42.8	54.8	0.5764
New River	36	Before (Ref.)	80.9	75.3	86.9	
		During	49.3	45.8	53.0	<0.0001
		After	78.0	73.0	83.4	0.4644
Pittsylvania/Danville	37	Before (Ref.)	64.4	62.4	66.5	
		During	51.2	48.7	53.9	<0.0001
		After	53.7	50.9	56.6	<0.0001
Roanoke	38	Before (Ref.)	81.5	78.6	84.6	
		During	50.4	48.2	52.7	<0.0001
		After	41.7	39.9	43.7	<0.0001
West Piedmont	39	Before (Ref.)	86.4	82.6	90.3	
		During	54.0	50.9	57.3	<0.0001
		After	57.7	54.7	60.9	<0.0001
Chesterfield	41	Before (Ref.)	69.4	66.6	72.4	
		During	47.1	45.0	49.2	<0.0001
		After	52.4	50.5	54.4	<0.0001

continued on p. 84



**Table 2 (continued). Estimated number of days to report STDs to the Virginia Department of Health, DDP, by health district, January 2000–June 2007**

Health district	District number	Reimbursement period <sup>a</sup>	Estimate	Lower 95% CI	Upper 95% CI	P-value <sup>b</sup>
Crater	42	Before (Ref.)	69.2	66.7	71.7	
		During	50.9	48.6	53.3	<0.0001
		After	47.9	46.0	49.8	<0.0001
Hanover	43	Before (Ref.)	84.4	78.7	90.6	
		During	64.3	59.5	69.6	<0.0001
		After	53.5	49.9	57.3	<0.0001
Henrico	44	Before (Ref.)	66.2	64.0	68.4	
		During	54.3	52.5	56.1	<0.0001
		After	54.8	53.1	56.5	<0.0001
Piedmont	45	Before (Ref.)	55.7	52.3	59.3	
		During	55.3	51.3	59.7	0.8943
		After	51.1	47.7	54.7	0.0660
Richmond	46	Before (Ref.)	68.9	67.8	70.1	
		During	45.1	44.2	46.1	<0.0001
		After	55.1	54.1	56.2	<0.0001
Chesapeake	51	Before (Ref.)	52.5	50.7	54.4	
		During	48.4	46.4	50.4	0.0031
		After	55.3	53.3	57.4	0.0467
Eastern Shore	52	Before (Ref.)	63.3	58.8	68.1	
		During	50.1	46.3	54.3	<0.0001
		After	49.0	45.0	53.3	<0.0001
Hampton	53	Before (Ref.)	55.9	54.4	57.5	
		During	42.5	41.2	43.7	<0.0001
		After	48.3	47.0	49.7	<0.0001
Norfolk	54	Before (Ref.)	73.4	72.0	74.8	
		During	69.2	67.4	70.9	0.0002
		After	67.7	66.3	69.2	<0.0001
Peninsula	55	Before (Ref.)	49.4	48.6	50.3	
		During	40.1	39.3	40.9	<0.0001
		After	48.0	47.1	49.0	0.0318
Portsmouth	56	Before (Ref.)	58.4	56.5	60.4	
		During	49.1	47.0	51.2	<0.0001
		After	53.9	52.1	55.9	0.0013
Virginia Beach	58	Before (Ref.)	55.6	54.4	56.9	
		During	39.2	38.3	40.1	<0.0001
		After	48.8	47.8	49.8	<0.0001
Western Tidewater	59	Before (Ref.)	53.6	51.6	55.6	
		During	42.0	40.1	44.0	<0.0001
		After	56.5	54.2	59.0	0.0625
Virginia total		Before (Ref.)	64.4	64.0	64.8	
		During	49.9	49.5	50.3	<0.0001
		After	53.7	53.4	54.1	<0.0001

<sup>a</sup>Reimbursement periods are defined as follows: before = January 2000–November 2002; during = December 2002–December 2004; after = January 2005–June 2007.

<sup>b</sup>P-values statistically significant at  $p < 0.05$

STD = sexually transmitted disease

DDP = Division of Disease Prevention

CI = confidence interval

Ref. = reference

was that offering reimbursements for mailing costs would be an effective incentive for LHDs and could possibly create better reporting habits, especially in areas that were sending STD case paperwork through the mail fewer than four times each month. However, our approach did not specifically target those areas, and reimbursements were made available to all 31 health districts that were mailing STD paperwork directly to the central office.

It is possible that sustained quarterly e-mails may have helped remind LHDs to pay special attention to reporting. The quarterly e-mail reminder did not continue after reimbursement ended, which makes it difficult to ascertain the independent effect of reminder e-mails vs. reimbursement itself. However, the maintained improvement that was noticed after both reimbursements and reminders ceased offers evidence toward the effectiveness of the reimbursement approach.

#### Limitations

One limitation of this project was that STDs diagnosed by LHDs in various clinic settings are usually reported to the state health department by the laboratory that performed the testing, while no formal morbidity notification is sent by the LHD itself. However, other types of paperwork related to STDs diagnosed by

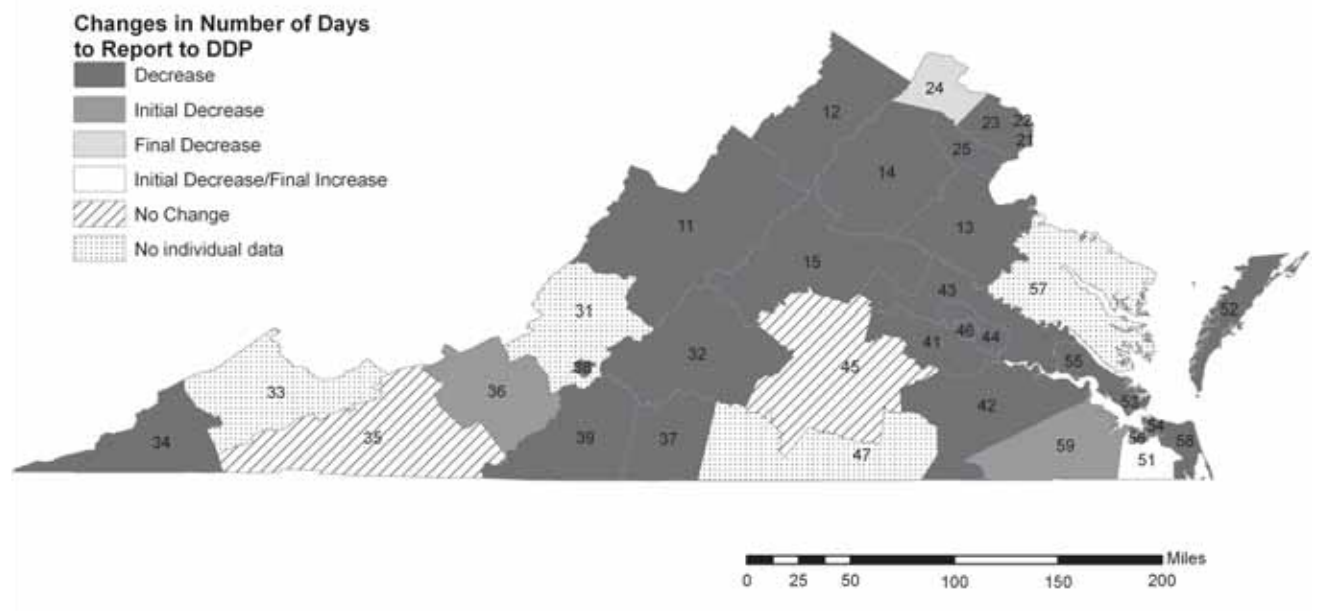
the LHD (field and interview records) were received throughout the entire assessment period, therefore providing a strong argument for inclusion of all STDs in our model.

Fourteen health districts did not follow the financial reimbursement procedure every quarter and, therefore, were not reimbursed for all quarters of the reimbursement period. Nevertheless, given that all 31 health districts were informed of the reimbursement process and received reimbursements for four out of the seven reimbursement quarters on the average, along with a reminder quarterly e-mail, we chose to include all of the health districts in our model for the entire time period.

Only five cases of the rare reportable STDs (lymphogranuloma venereum, chancroid, and granuloma inguinale) occurred during our observation period, and we did not include these in our analysis. Based on the very small number of these compared with other STDs, we believe that their inclusion would not have significantly altered the results of our analysis.

One possible limitation of this analysis was that our model used a negative binomial regression to estimate reporting lag times, but did not account for the size of the jurisdictions. Case reporting load could be important in a jurisdiction's ability to improve and sustain timeliness of reporting. The jurisdictions that did not

**Figure 2. Geographic distribution of the changes in reporting timeliness of STD data to the Virginia Department of Health, DDP, by health district, January 2000–June 2007**



STD = sexually transmitted disease

DDP = Division of Disease Prevention



show substantial improvement were relatively smaller, although not the smallest in Virginia. We believe that the lack of significant improvement may be explained at least partially by the fact that their lag times (both raw and estimated) were comparatively smaller to start with, leaving less room for improvement, as the desired reporting habits were already established. The health districts that showed steady improvement in lag times were wide-ranging in terms of their size and the number of cases they contributed, included both urban and rural areas, and represented a majority of Virginia health districts; these findings offer a strong argument toward the effectiveness of the intervention in all types of jurisdictions, regardless of size.

One alternative way to examine timeliness of STD reporting would involve analyzing the number of mailings as an estimate of mailing frequency. In our project, we chose the difference between date reported and date diagnosed for each case by district because we believed this to be a more accurate measure of reporting timeliness.

Virginia's paper reporting system adds an extra burden on LHD personnel, which sometimes results in significant delays in reporting STDs to the national data system. While providing mailing cost reimbursements did improve reporting in a majority of our project areas, the median overall delay for receiving paperwork in the central office was 38 days after the case diagnosis. This may also be due to occasional data-entry delays, which we could not account for in our model. However, such delays have historically been minimal; for a majority of the time period included in the analysis, case reports and related paperwork were consistently entered into the STD surveillance database within five days of receipt. To further improve reporting timeliness, alternative solutions to paper reporting of STDs should be considered, so that private providers and laboratories report these conditions directly to the

central office and the LHD, thereby eliminating the need for the extra step in our reporting system.<sup>8</sup>

One possible no-cost alternative that may be considered in improving timeliness of reporting may be reminder e-mails. Our analyses cannot clearly separate the effect of the reminders from the effect of reimbursement itself; however, repetitive reminders may be of some help in improving lag times in reporting.

## CONCLUSION

Providing mailing cost reimbursements resulted in improved timeliness of reporting for more than three quarters of Virginia's health districts. Therefore, the initial assumption of the effectiveness of the mailing reimbursements appears justified. Further analyses are warranted to determine why reimbursement was more effective in some health districts compared with others, as well as to assess continued sustainability of our project in health districts that indicated improved reporting timeliness.

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