

Influence of a hospital-based antimicrobial stewardship program on clinical and economic outcomes. The experience from a referral center in Mexico.

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Background

Antibiotic stewardship programs (ASP) are relatively new in Mexico. It was until May 2018 that it was established as a public health policy in the country. Few hospitals have acknowledged the mandate and started an ASP despite the efforts and high antimicrobial resistance rates in our country. Besides, little has been done to evaluate the efficacy of the program in terms of antibiotic expenditure and the incidence of associated infections. Therefore, the main objective was to evaluate antibiotic expenditure before and after the ASP in a third-level hospital in Mexico. As a secondary analysis, the relationship with *C. difficile* infections was explored.

Methods

Retrospective and descriptive study from January 2017 to February 2020 (pre-COVID-19 pandemic). The antimicrobial optimization program that was established is a **hybrid model**, which includes in its components the **pre-authorization of antimicrobials** and the **prospective audit** (prescription based on a local treatment guide according to our epidemiology and resistant rates). **Mean antibiotic expenditure** (adjusting for DDD/patient days-costs in USD) was evaluated before and after (June 2018 as the first month of implementation) the ASP. Statistical difference of the means was evaluated. It was also performed an exploratory analysis between the **prescription of Clindamycin and Levofloxacin with the number of cases and deaths related to *Clostridioides difficile* infection**.

Results

The average antibiotic expenditure before ASP was US\$13,468 ± 3,267, and US\$8,193 ± 2,574 (p<0.001) after. Graph 1 presents the changes in trend. Specifically, caspofungin, ciprofloxacin, clindamycin, fluconazole, levofloxacin, linezolid, piperacillin/tazobactam, and tigecycline showed statistically significant reduction after June 2018. Graph 2 displays the descriptive relationship between the prescription of levofloxacin and clindamycin, the cases of *C. difficile* infection, and the elimination of all associated mortality.

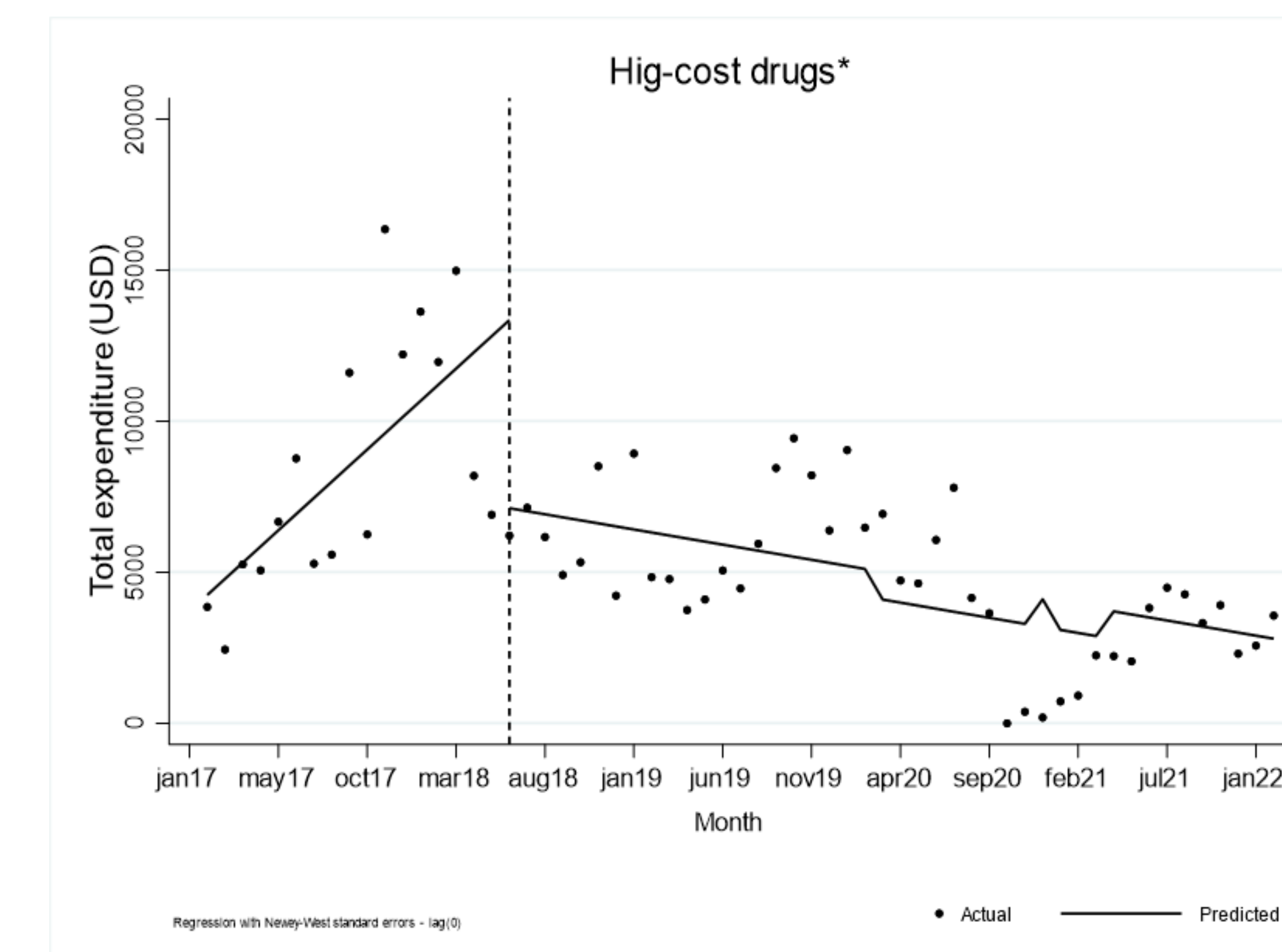
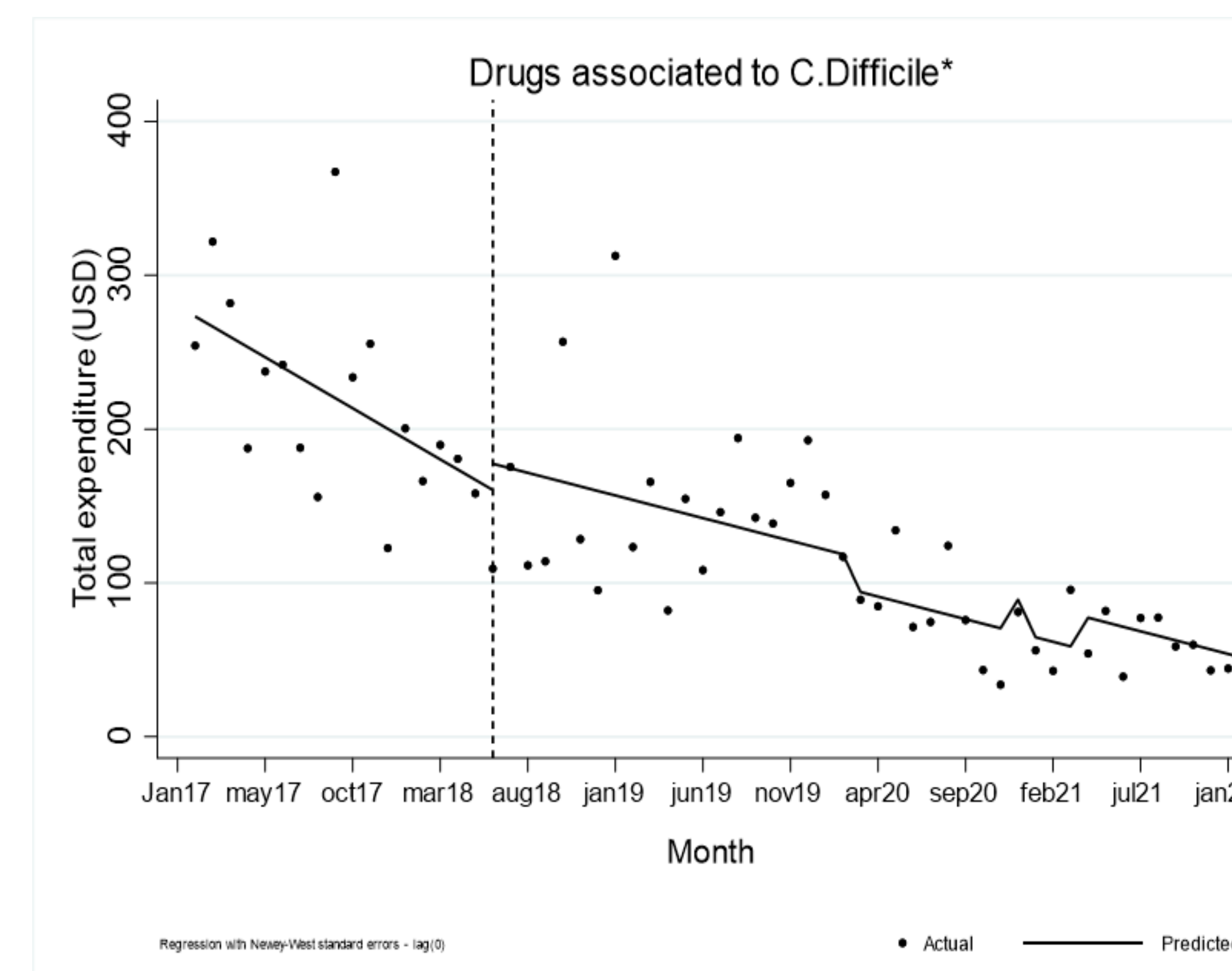
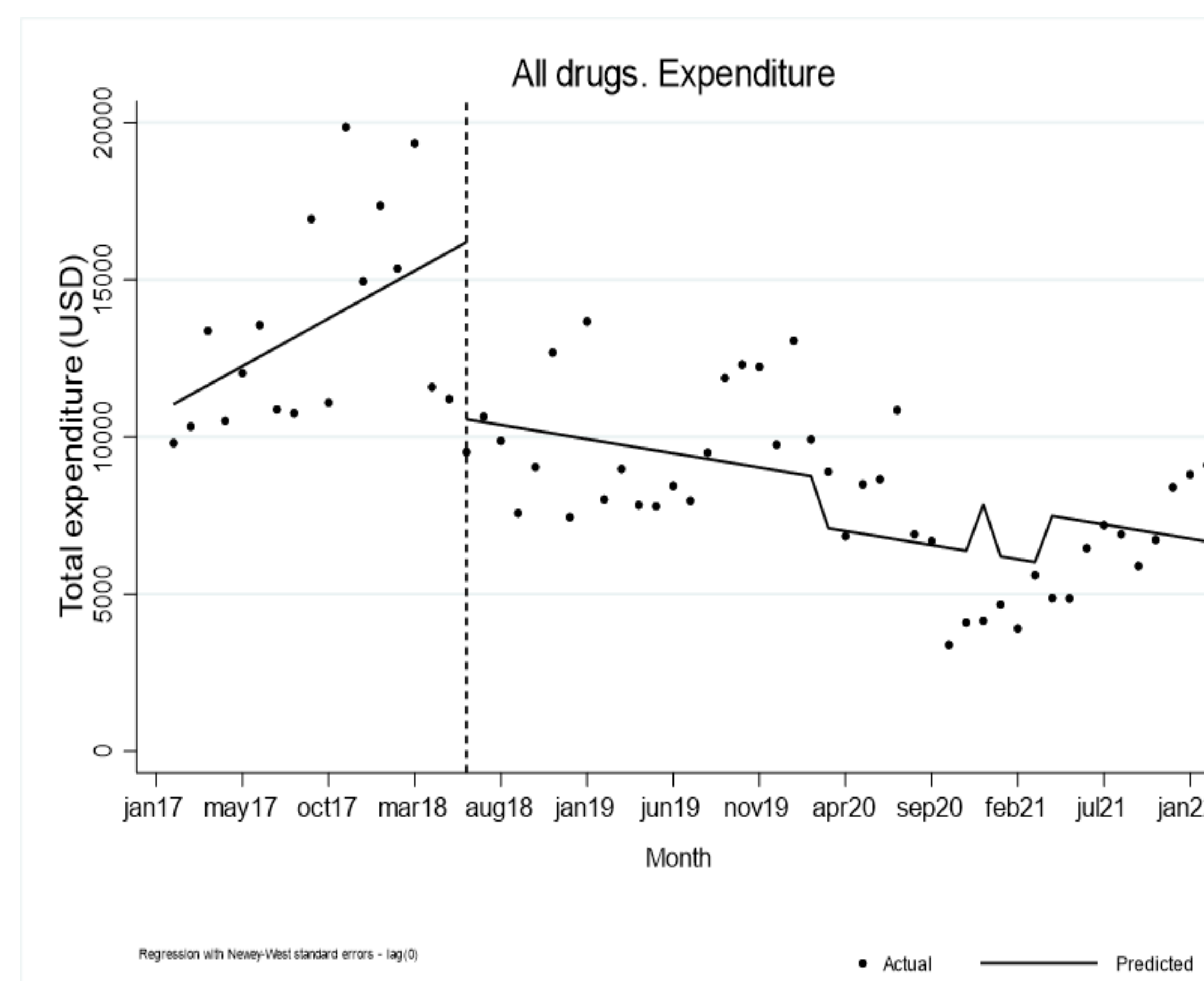
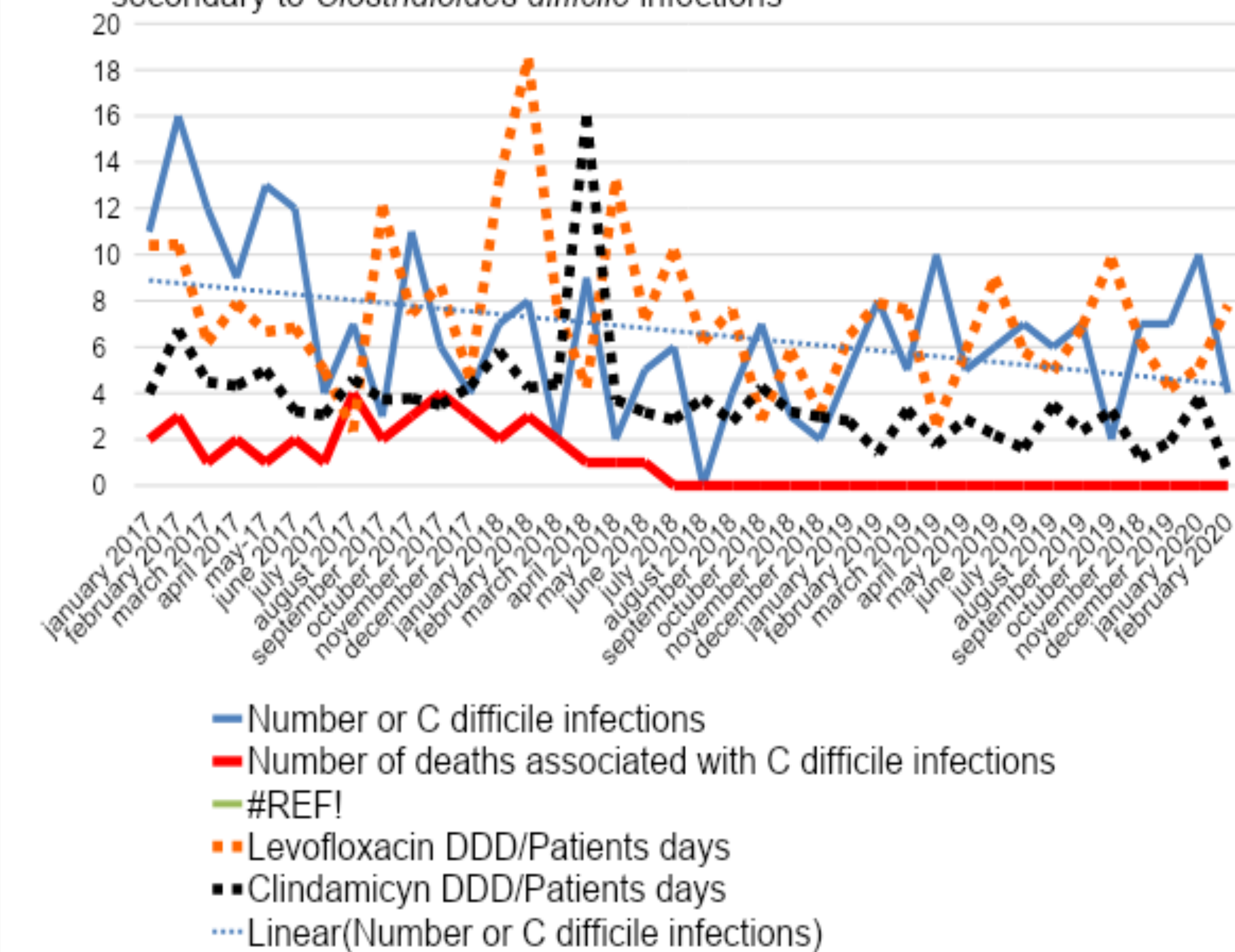
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Antimicrobial (mean ± S.D.)	Total (usd)	Pre-intervention	Post-intervention	p-value	Post-intervention (no COVID-19 period)	p-value
Caspofungin	1,639.7 ± 2,083.5	3,492.2 ± 2,486.1	924.1 ± 1,369.8	<0.001	1,603.1 ± 1,674.5	0.008
Clindamycin	44.1 ± 30.4	76.1 ± 15.6	31.7 ± 25.3	<0.001	52.2 ± 22.7	0.007
Ertapenem	3,166.7 ± 2145.1	3,391.6 ± 2,468.6	3,079.8 ± 2,030.9	0.615	4,005.7 ± 1,857.2	0.387
Meropenem	335.9 ± 240.7	369.6 ± 343.4	322.9 ± 190.6	0.502	290.3 ± 161.9	0.354
Imipenem	129.9 ± 92.2	151.2 ± 85.2	117.5 ± 93.9	0.203	114.9 ± 65.6	0.147
Ciprofloxacin	9.6 ± 15.5	26.7 ± 21.3	3.1 ± 2.5	<0.001	3.1 ± 2.5	<0.001
Levofloxacin	85.8 ± 45.9	117.4 ± 43.7	73.5 ± 41.1	0.001	96.8 ± 41.4	0.144
Linezolid	343.8 ± 166.9	434.4 ± 180.6	308.8 ± 149.2	0.007	377.3 ± 150.2	0.294
Metronidazole	224.2 ± 129.5	357.5 ± 128.7	172.7 ± 86.7	<0.001	218.6 ± 60.4	0.001
Piperacillin/taz	217.7 ± 324.4	414.7 ± 476.5	141.6 ± 202.7	0.003	132.1 ± 72.2	0.011
Tigecycline	461.9 ± 403.5	806.4 ± 378.5	328.8 ± 329.9	<0.001	561.7 ± 334.6	0.042
Vancomycin	613.4 ± 288.2	701.6 ± 237.4	579.3 ± 301.1	0.138	668.3 ± 198.5	0.640
Drugs associated to C. Diff ¹	139.5 ± 78.4	220.2 ± 63.5	108.3 ± 59.3	<0.001	151.9 ± 54.3	0.001
High-cost drugs ²	5,775.8 ± 3459.5	85,530.3 ± 4,152.3	4,711.6 ± 2,474.8	<0.001	6,302.8 ± 1,818.3	0.033
All drugs	9,663.8 ± 3644.4	13,468.1 ± 3,267.2	8,193.9 ± 2,574.6	<0.001	9,912.9 ± 1,988.41	0.000

Intervention start on June 2018. S.D= standard deviation. 1: Clindamycin/Levofloxacin/Ciprofloxacin 2: Caspofungin/Ertapenem/Tigecycline/Colistin. Prices in dollars at the exchange rate of April 28, 2022

Graphic 2. Relationship between monthly consumption of clindamycin and levofloxacin and the number of cases/deaths secondary to *Clostridioides difficile* infections



Conclusion

The ASP has significantly reduced the antibiotic expenditure in the hospital. Besides reducing the prescription of associated antibiotics, a possible reduction in *C. difficile* infections and associated deaths was observed.

