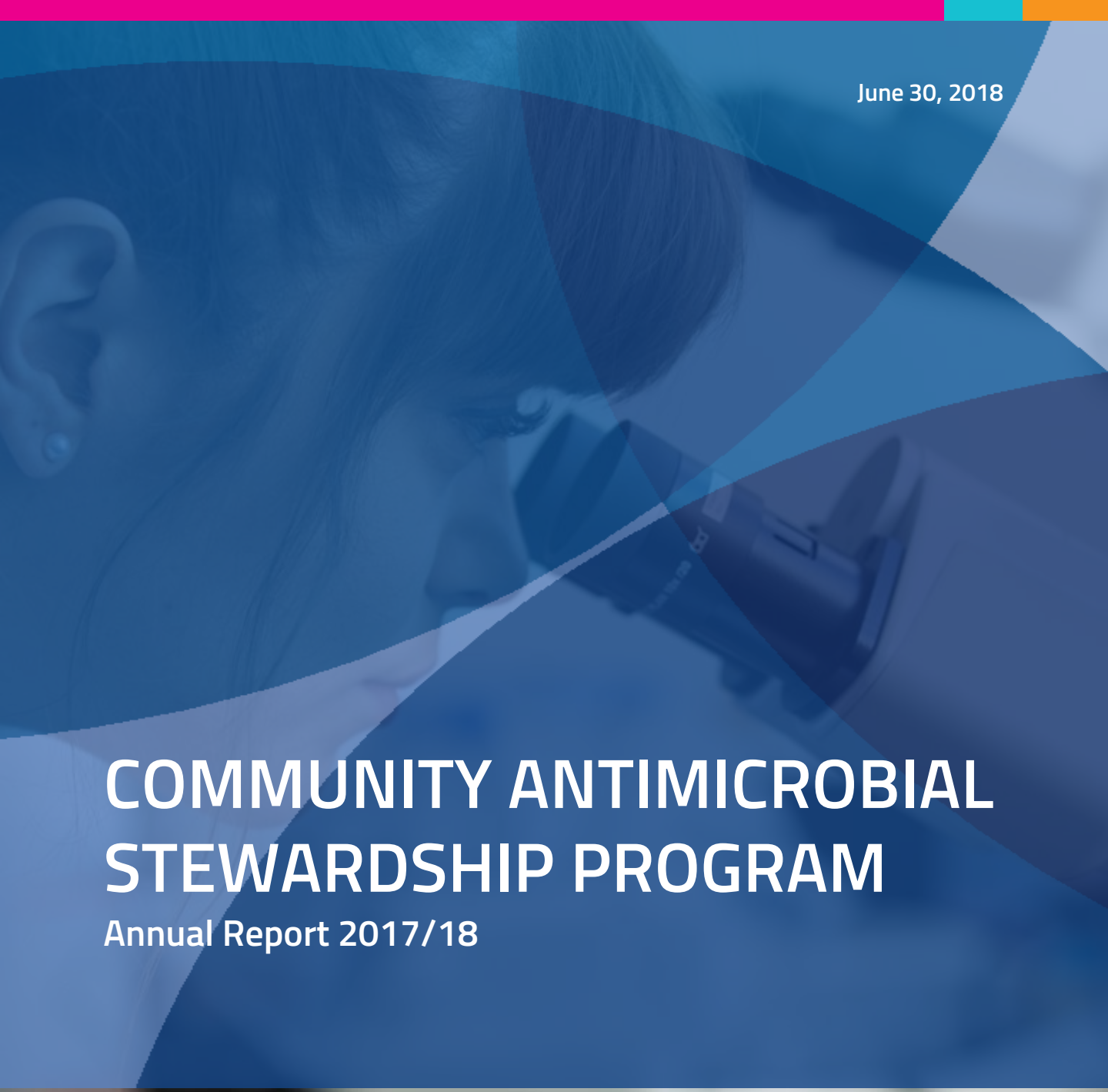
June 30, 2018



COMMUNITY ANTIMICROBIAL STEWARDSHIP PROGRAM

Annual Report 2017/18

BC Centre for Disease Control
An agency of the Provincial Health Services Authority

British Columbia

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Executive summary

Beginning in 2005 with Do Bugs Need Drugs?, the Community Antimicrobial Stewardship program at the B.C. Centre for Disease Control (BCCDC) has been tackling the important issues of antibiotic overuse and misuse and antimicrobial resistance. In 2017/18 the team undertook a wide range of activities aimed at addressing this growing public health concern.

Activities

- A public transit advertising campaign in late 2017 garnered 23.3 million impressions in communities across B.C.
- The program's online presence continued to grow through the Antibiotic Wise and Do Bugs Need Drugs? websites, and social media channels.
- 6,558 individuals were provided education through the Do Bugs Need Drugs? program.
- An innovative partnership with Kids Boost Immunity has seen almost 500 grade 8 students complete antibiotic use and antibiotic resistance lessons online, while earning vaccines for UNICEF in the process.
- 3,914 health care professionals received antimicrobial resistance continuing education.
- The Bugs & Drugs online reference guide was made available to all practitioners universally across the province at www.bugsanddrugs.org.

Outcomes

- Overall prescription rate of antibiotics in B.C. decreased 1% in 2016, and is down 13.3% overall since 2005.
- Prescription rate among the <1 age group is down 57% since 2005, and in the age group 1-4 it is down 41%.
- Antimicrobial resistance trends of bacteria to specific antibiotics continued to be tracked and reported publicly across B.C. in the program's Antimicrobial Resistance Dashboard.
- Results of research on the use of antibiotics in long-term care facilities in B.C. were published in the December 2017 edition of the Journal of the American Medical Directors Association.
- A cost-benefit analysis of the program was completed showing more than $400 million has been saved in antibiotic costs in B.C. since 2005.

Impacts

- A reduction in overall antibiotic use of 1.42 DDD/1000 inhabitant days was observed in 2016 compared with 2005.
- Prescription rates for macrolides declined 38% in 2016, and utilization rates dropped by 39%.
- Prescription and utilization rates for fluoroquinolones have both declined around 30% in 2016 compared to 2005.
- Prescriptions for bronchitis are 27% lower in 2016 compared with 2005.
- Prescriptions for otitis media are 39% lower in 2016 compared with 2005.

Introduction

Antibiotics have been used since the mid-20th century to treat bacterial infections, and great strides have been made in health care and public health due to their use. Infections which in the past may have been deadly are now often easily treated, and the use of antibiotics has made modern medical procedures such as surgeries and chemotherapy possible.

However human antibiotic use is a known driver of antibiotic resistance[1,2]. Although antibiotic resistance is a naturally occurring biological phenomenon, it has been exacerbated by the overuse and misuse of antibiotics. When antibiotics are used too much or incorrectly, bacteria causing illness may no longer respond to the drug.

Antibiotic resistance is a global concern. If not managed, it has the potential to undo many of the gains made in global health over the past century[3]. It is estimated that 23,000 people die each year in the United States as a direct consequence of antibiotic resistance, and resistant infections complicate tens of thousands of routine physician visits each year in B.C.[4]. As such, concerted effort is needed to strategically reduce the overuse and misuse of antibiotics at the individual and population levels. Combined, these efforts not only have the potential to arrest and possibly reverse the current upward trends in resistance, but also have the potential to alleviate the burden placed on individuals and the health care system associated with antimicrobial resistant infections[5].

The Community Antimicrobial Stewardship program at the B.C. Centre for Disease Control is tackling this important issue. Beginning with Do Bugs Need Drugs? in 2005, the program has grown into a multifaceted initiative with activities focusing on community outreach, public and healthcare professional education, and research and surveillance. The program aims to reduce the overuse and misuse of antibiotics in B.C. to ensure we continue to have effective treatments for bacterial infections in the future.

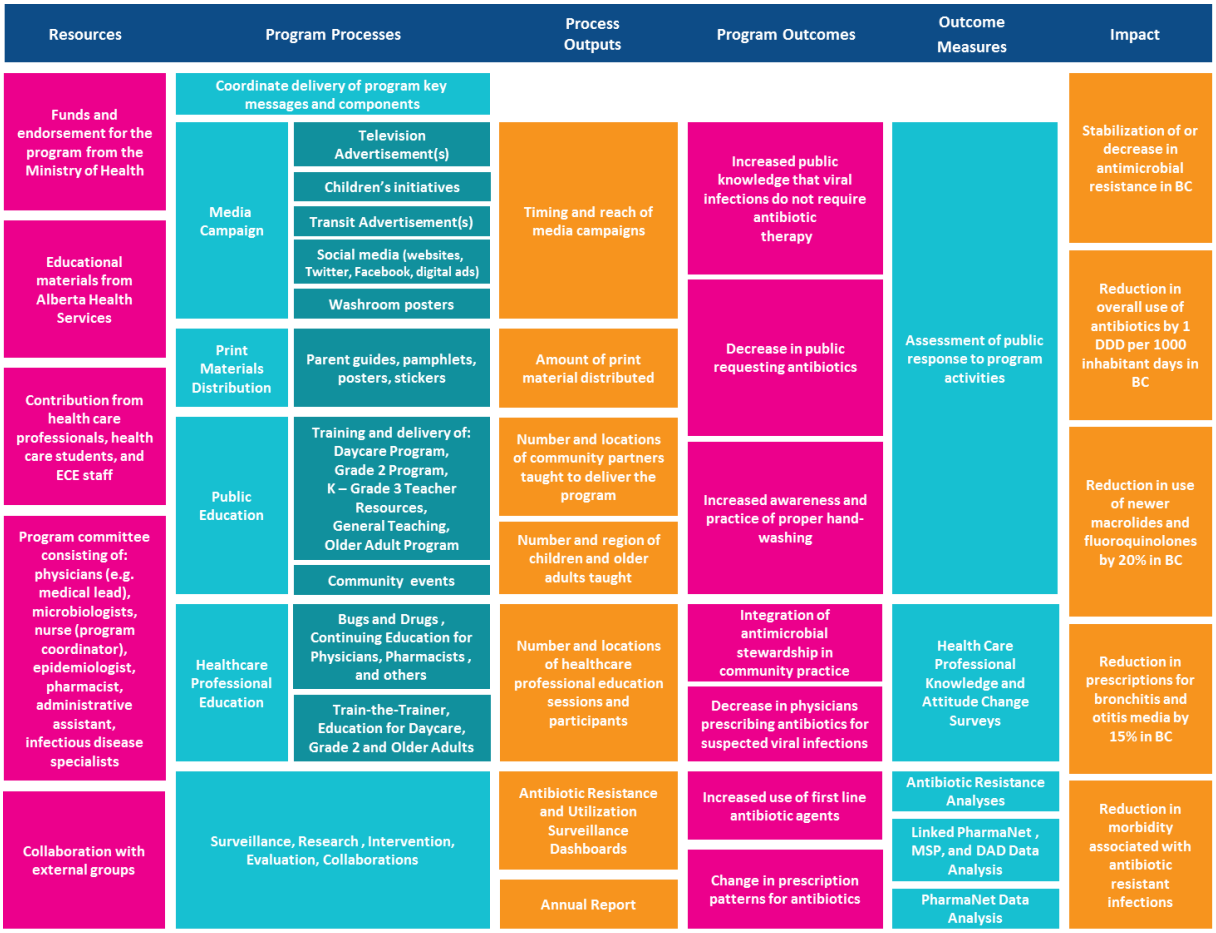
The wide array of projects and activities undertaken by the Community Antimicrobial Stewardship program all tie back to three key messages which are targeted at the public and health care professionals in the community:

Wash your hands
Hand washing is the best way to stop the spread of infections.

Know that not all bugs are created equal Antibiotics work against bacteria, but not against viruses.

Use antibiotics wisely
Bacteria can become resistant to antibiotics if not used appropriately.

Program logic model



The program logic model depicts the different components of the overall program as well as how they contribute to a decrease in antibiotic resistance in B.C. through public and professional education and an increase in proper antibiotic prescribing practices. The model is used in the planning, implementation, and evaluation of the program. The model is dynamic and changes as the program develops. An update on the progress of logic model impacts is included in the **Impacts** section of this report.

The program team has undertaken a workshopping process to update and revise the logic model. This new logic model will guide program activities from the 2018/19 fiscal year onwards, and outlines new and updated priority impacts.

Program team

The Community Antimicrobial Stewardship program team

Team members

Dr. David Patrick	Medical Epidemiology Lead
Dr. Edith Blondel-Hill	Medical Director, Do Bugs Need Drugs?
Tiffany Barker	Public Health Manager
Nick Smith	Project Manager
Abdullah Mamun	Epidemiologist
Jason Curran	Knowledge Translation Lead
Erin Fraser	Public Health Veterinarian
Kate O'Connor	Nurse Educator
Hattaw Khalid	Administrative Assistant

The team would also like to recognize the contributions of Kim Dreher (Program Coordinator, retired February 2018), Laura Moore (Administrative Assistant, resigned April 2018), Stuart Shepherd (Social Media Consultant, contract ended March 2018) and Lauren Mathany (Public Health Manager, on maternity leave until Spring 2019).

ACTIVITIES

Public outreach

Public transit advertisements

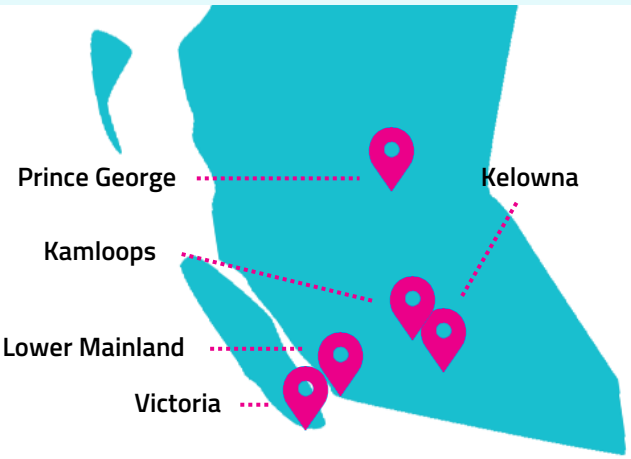
This year's public transit media campaign ran from October to December 2017 with the theme: ***Join the global fight against antibiotic resistance – take the pledge!***

6 week campaign

+4 bonus weeks

70 exterior bus ads

175 interior bus ads



23.3 million total impressions [6]

Social media

Twitter

	@AntibioticWise	@DoBugsNeedDrugs
Total followers	368	1 208
Followers gained this year	200	228
Change in followers	+119%	+23%
Total reach	57,390	622,114
Reach this year	43,690	70,264

Facebook

	/AntibioticWise	/DoBugsNeedDrugs
Total followers	44	339
Followers gained this year	44	18
Total reach	15,795	3,787,979
Reach this year	15,795	17,913

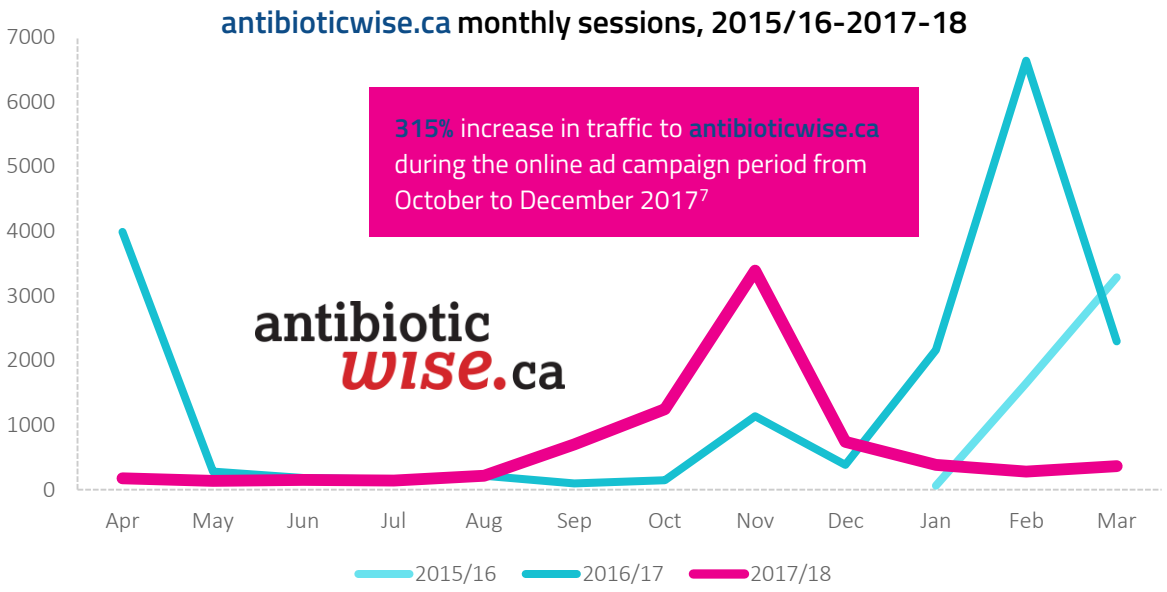
Facebook ad campaign

8
weeks

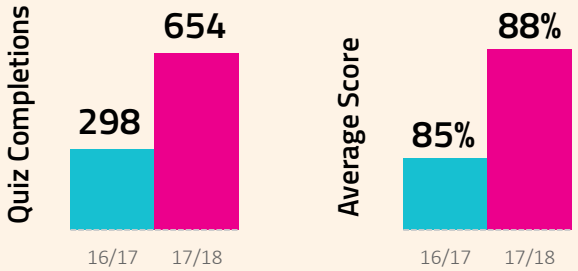
35,772
impressions

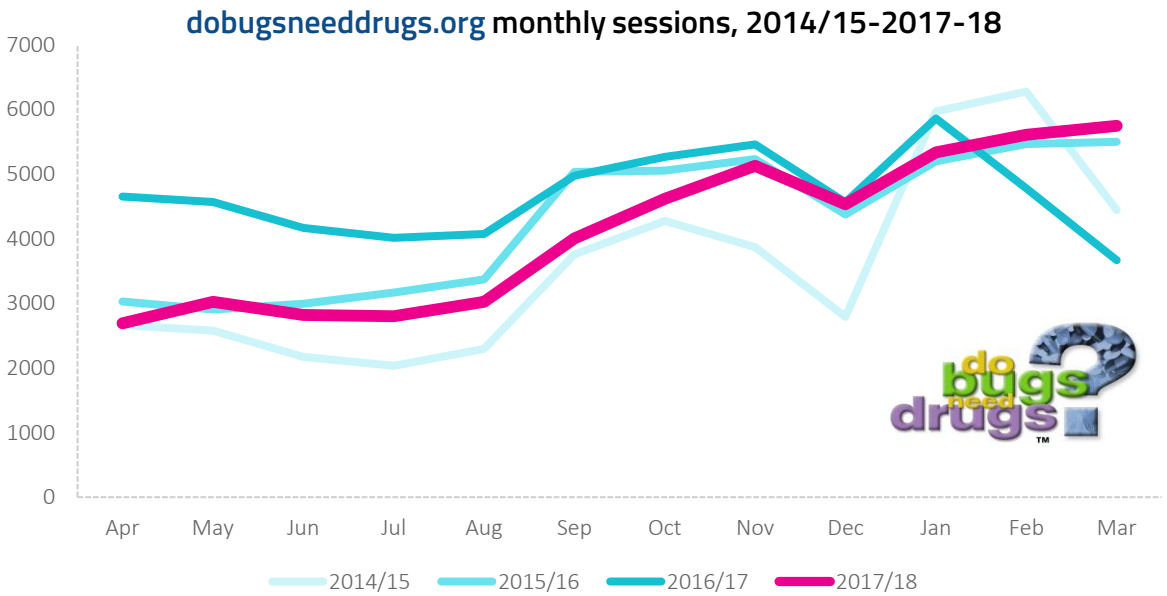
877
clicks to website

Websites



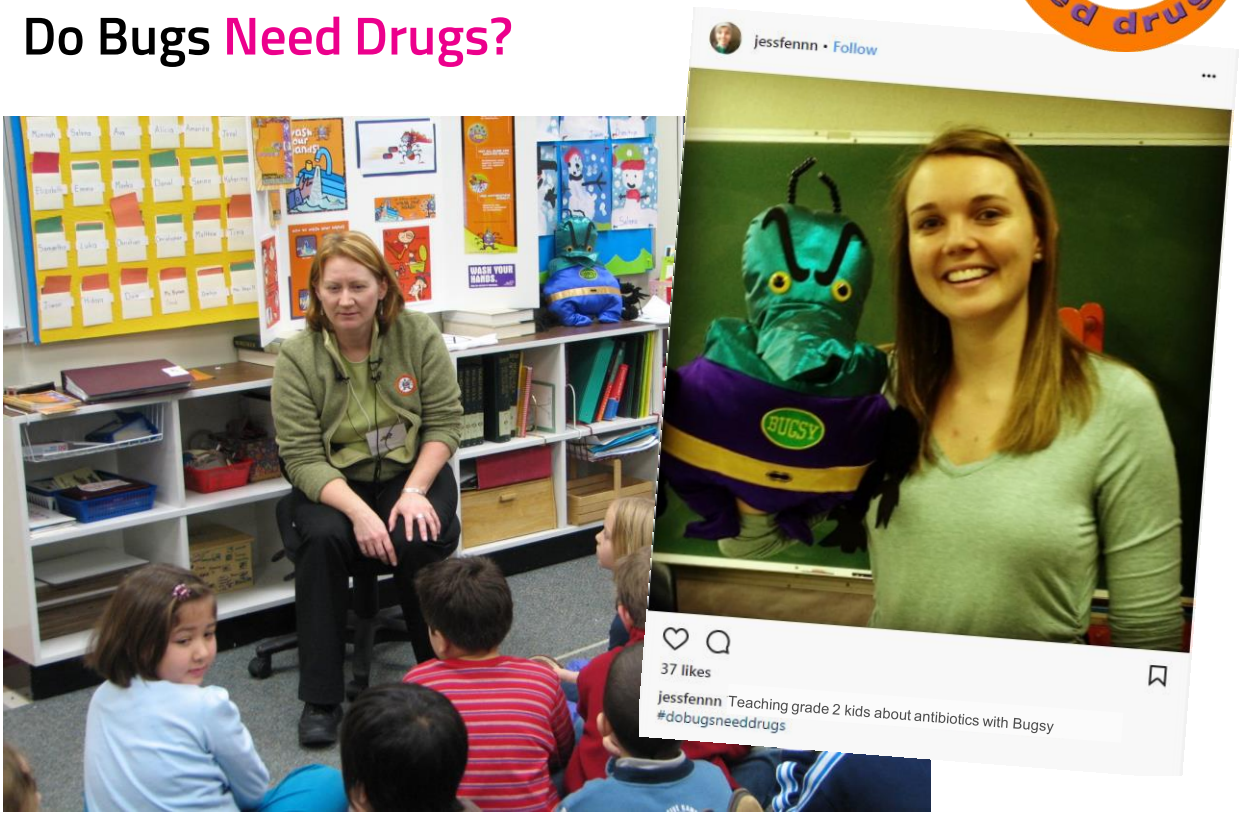
A quiz about antibiotics and AMR available on **antibioticwise.ca** saw an increase in both number of completions and average score in 2017/18. This may indicate an increase in general public knowledge of these important issues.



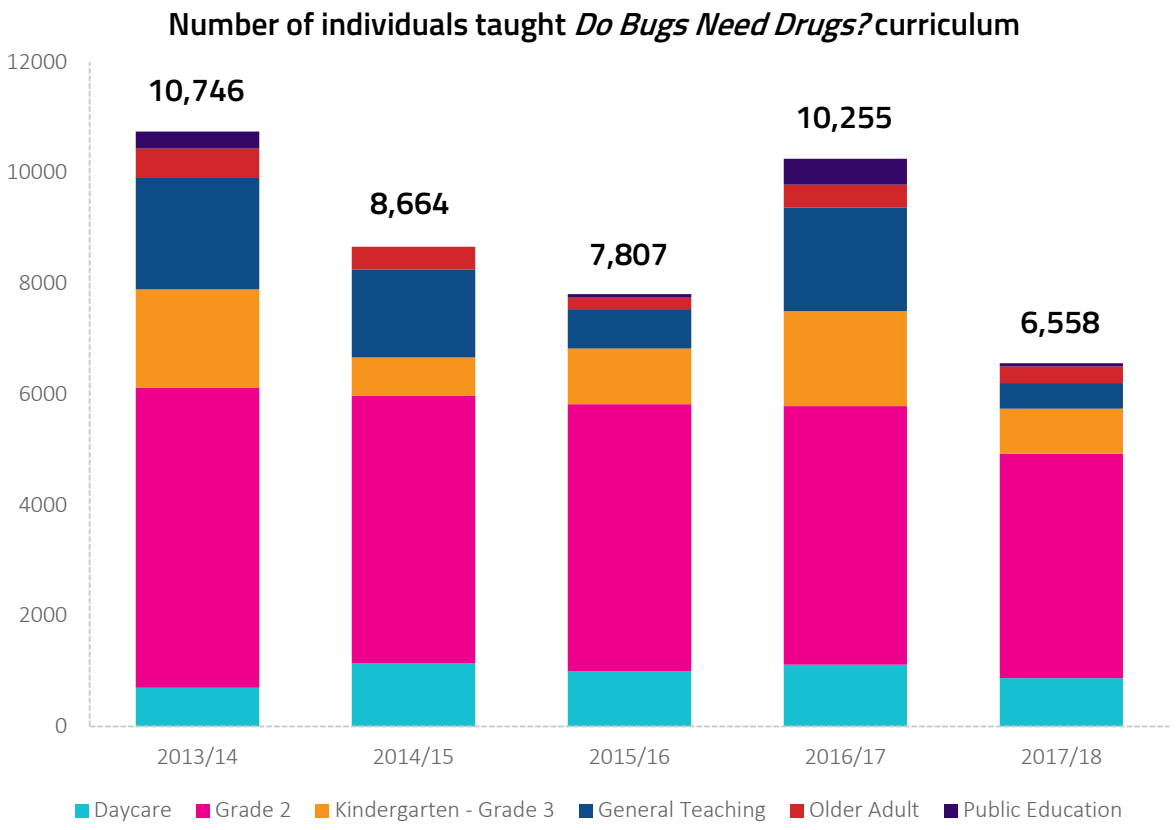


Public education

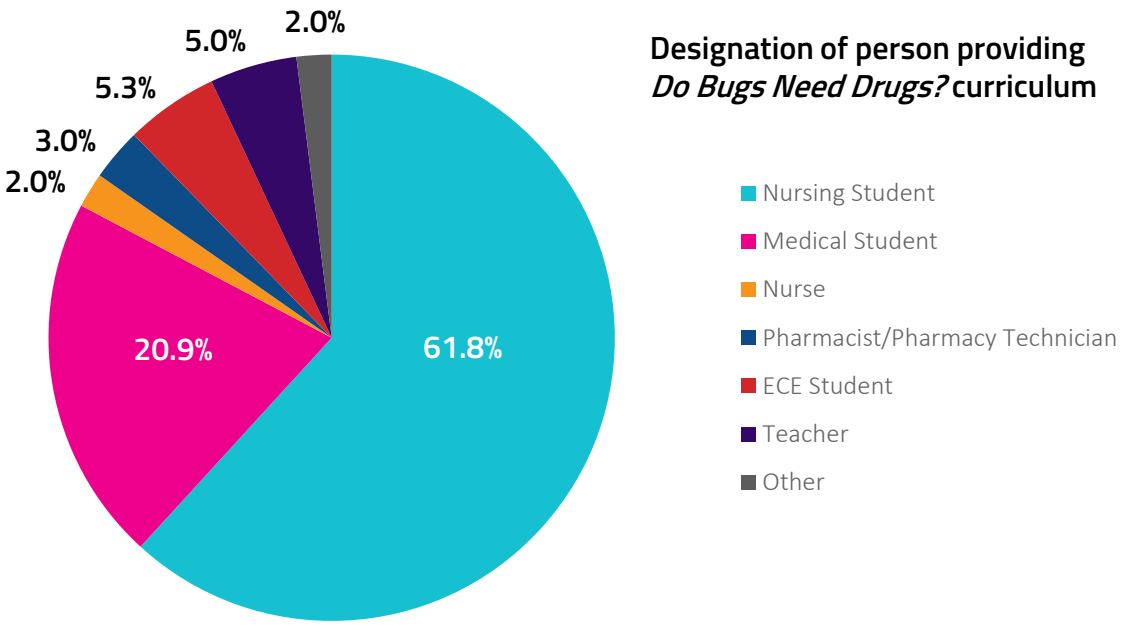
Do Bugs Need Drugs?



Program	Description
Daycare	For pre-school children aged 2-5 emphasizing the importance of handwashing and introduces germs and illness through activities, songs and parent-intended material.
Grade 2	For children aged 7 and 8 stressing the importance of proper and frequent handwashing, the dangers of misusing antibiotics, and the basic differences between viruses and bacteria.
Kindergarten – Grade 3	Resources meeting B.C. education curriculum that allow teachers to incorporate Do Bugs Need Drugs into their classroom, intended for children approximately 6 to 10 years of age.
General Teaching	Sessions incorporating elements of the formal education programs adapted for different age groups or abilities. Delivery and adaptations of these sessions is at the discretion of the trainer.
Older Adult	Focused on teaching older adults in care the three key messages of Do Bugs Need Drugs.



124,901 people across B.C. have been taught the Do Bugs Need Drugs? curriculum since 2005



Kids Boost Immunity

Kids Boost Immunity is a new online learning resource linked with science and social studies curriculums that also provides the opportunity for students to earn vaccines for children in need through UNICEF. The Community Antimicrobial Stewardship program partnered with KBI (a joint partnership between the Public Health Agency of B.C., the B.C. Ministry of Health, and the Public Health Agency of Canada) to develop lessons and quizzes on antibiotics and antibiotic resistance for the website. KBI officially launched April 23, 2018, and the data below represents preliminary results from launch date to May 31, 2018.

462 estimated number of students completing all or part of AMR lessons

8317 total AMR quiz questions answered

74.6% questions answered correctly

Best answered questions

Different types of antibiotics treat different infections — 91.5% ☑

Handwashing is the best way to stop the spread of infections within your family (friends, work, etc.) — 90.7% ☑

Worst answered questions

Antibiotic resistance occurs when your body changes in a way that reduces or eliminates the effectiveness of antibiotics — 44.0% ☑

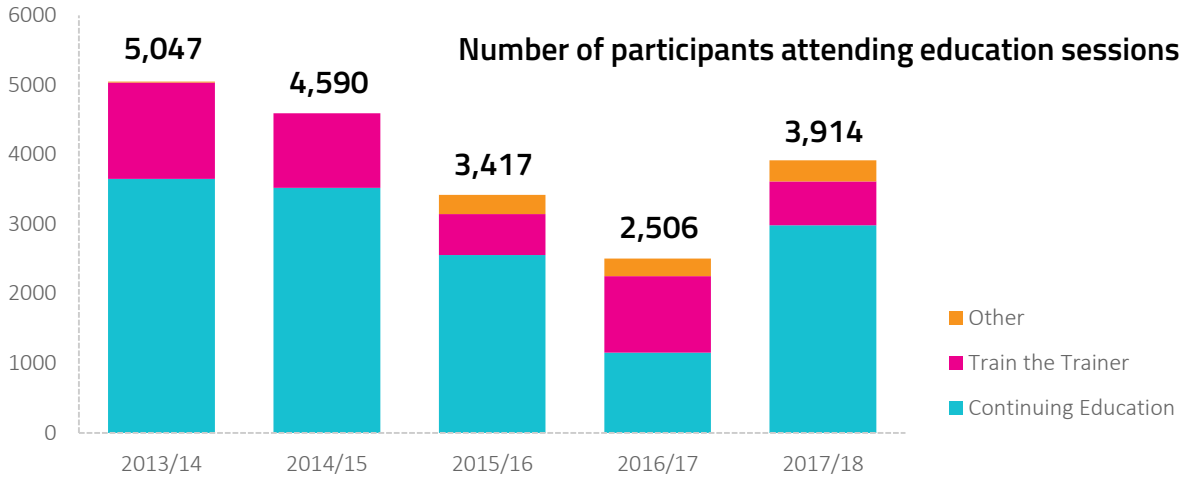
Antibiotics can be used to treat colds and influenza (flu) — 58.6% ☑

An estimated 500 vaccines have been donated to UNICEF as a result of completed antimicrobial resistance lessons

Professional education

Education sessions

Professional education sessions provide training for healthcare professionals and students to teach the DBND education curriculum, as well as continuing education for professionals on the program's main messages, including CME events, and conference posters and presentations.



2017 professional education highlights

Nova Infectious Diseases Update
October 27 & 28, 2017 - Victoria, B.C.

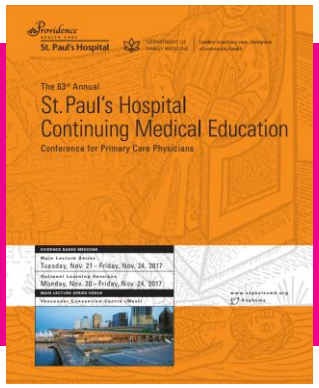
Bugs & Drugs: How to Optimize Your Antibiotic Use
Dr. David Patrick

346 attendees

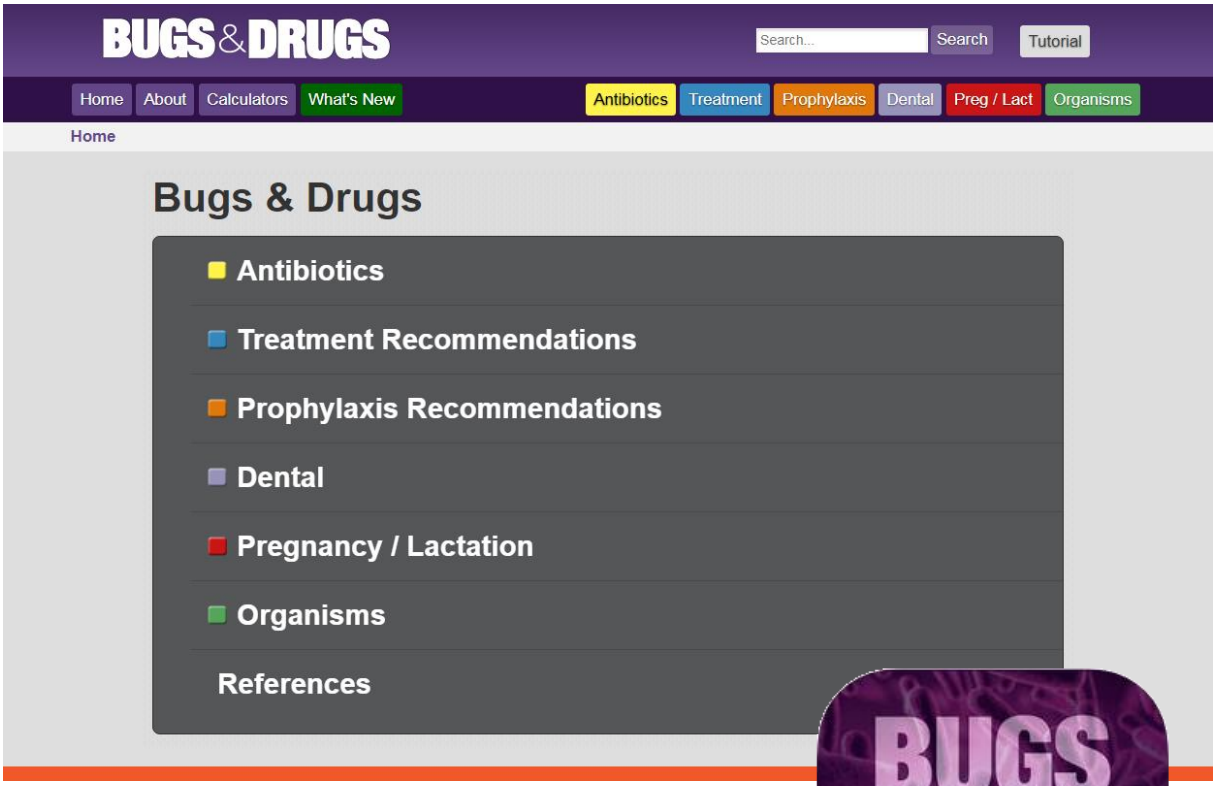
St. Paul's Continuing Medical Education
November 21-24, 2017 - Vancouver, B.C.

Symptom Free Pee Let It Be!
Best Antibiotic Choices for UTI Treatment
Dr. David Patrick

1,615 attendees



Bugs & Drugs reference guide



The Bugs & Drugs Antimicrobial Reference Guide has been available free-of-charge across B.C. since March 2017. The guide is also available for purchase as an iPhone/Android mobile app. The statistics below represent the web version of the guide only[8].

2017/18 Bugs & Drugs website statistics

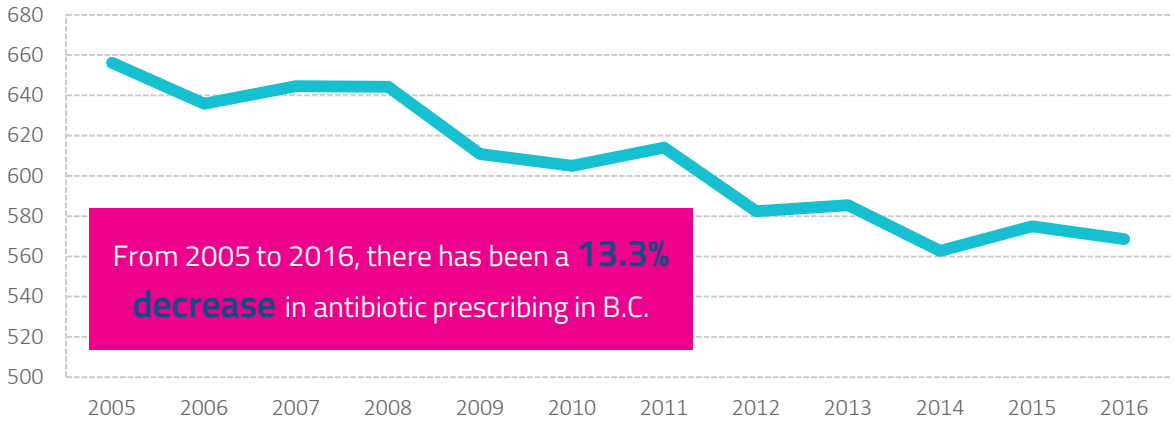
Total users	**10,123**
Total sessions	**28,336**
Pages per session	**8.9**
Average length of session	**3 min 37 sec**
Number of communities guide accessed in	**86**

OUTCOMES

Antimicrobial utilization

Detailed prescribing data for B.C. can be found on the Antimicrobial Utilization Dashboard on the BCCDC website

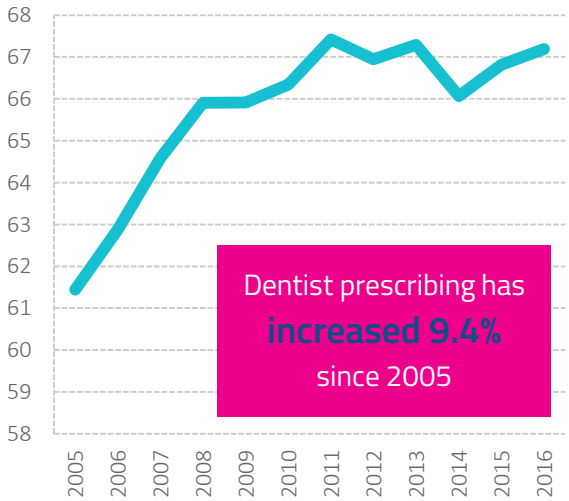
Overall B.C. prescription rate/1000 population/year



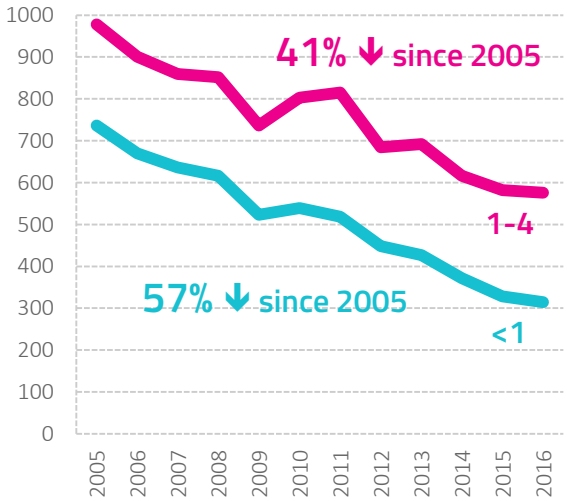
Top prescribed antibiotics in B.C.

Amoxicillin | Clarithromycin | Azithromycin | Amoxicillin and enzyme inhibitors | Doxycycline

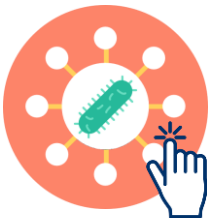
Dentist prescribing rate/1000 population/year



Prescribing rate/1000 population/year for ages <1 and 1-4



Antimicrobial resistance



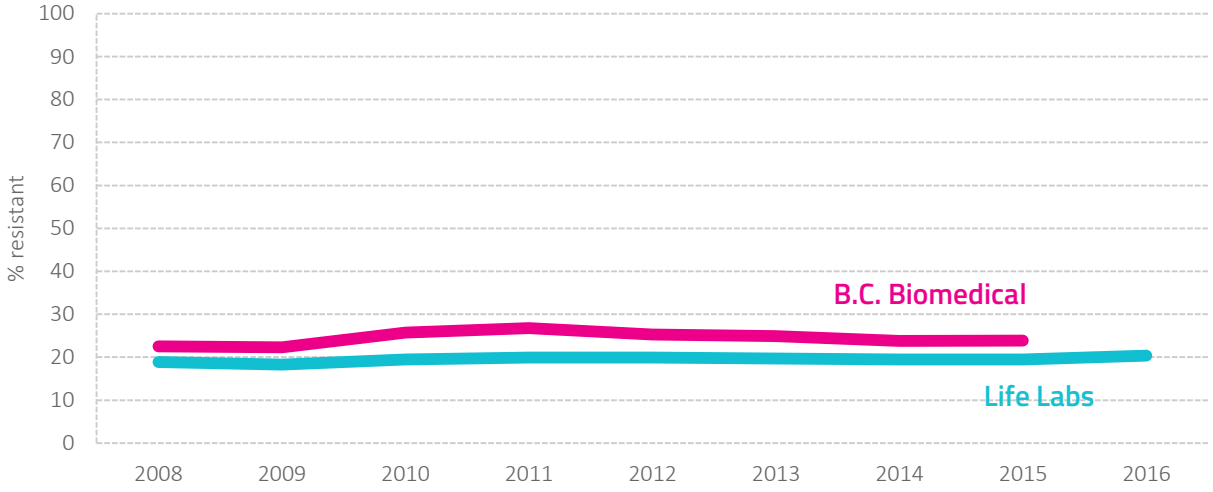
Detailed resistance data for B.C. can be found on the Antimicrobial Resistance Dashboard on the BCCDC website

Surveillance activities allow for the evaluation of the impact of the Community Antimicrobial Stewardship program on resistance rates for specific pathogens and drug classes of interest in B.C.

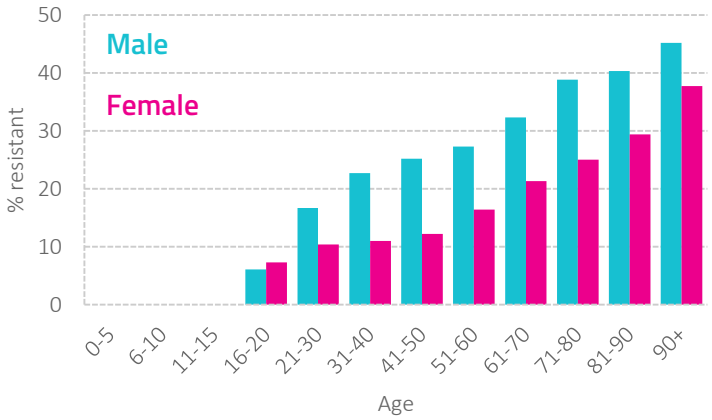
Prior to 2016, antimicrobial resistance data was provided in two separate datasets from B.C. Biomedical Services and LifeLabs Medical Laboratory Services. As of 2016, a single consolidated dataset from Life Labs has been used.

Highlights from 2016 are presented below.

E. coli resistance to ciprofloxacin



% *E. coli* resistance to ciprofloxacin by age group

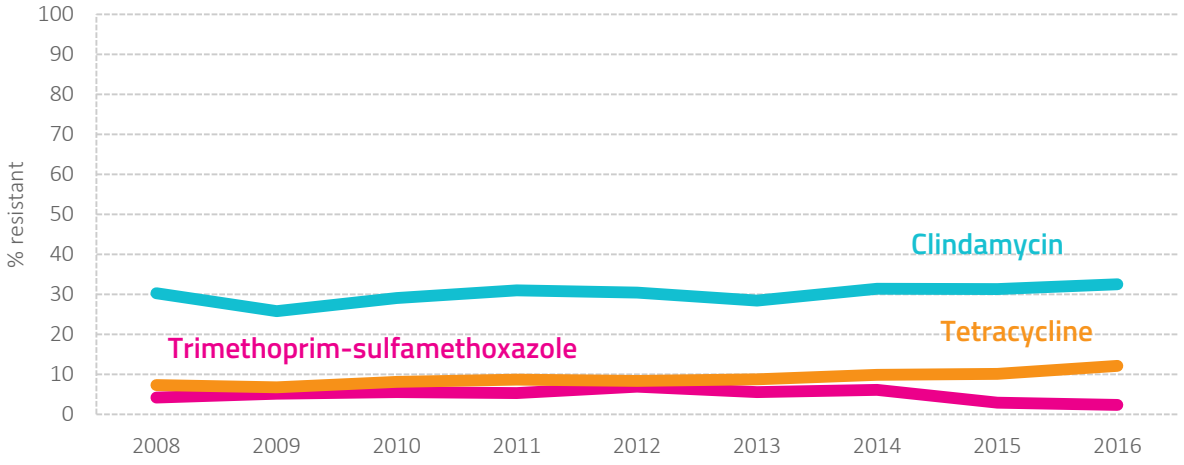


The proportion of *E. coli* isolates resistant to ciprofloxacin has increased slightly in 2016.

The proportion of resistant *E. coli* isolates increases with age.

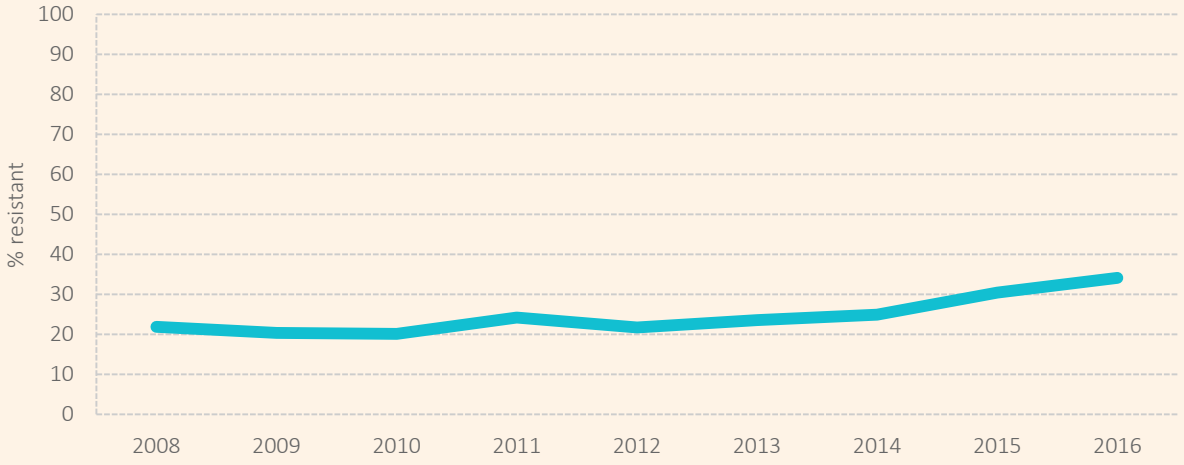
Resistance of *E. coli* to 3rd generation cephalosporins (cefotaxime, ceftriaxone, ceftazidime) has remained stable over the past few years. Since 2014, resistance rates have ranged depending on geographic area between approximately 8% and 22% for this class of antibiotics.

MRSA resistance in select antibiotics



MRSA isolates (both clinical and screen) made up 21.5% of all *S. aureus* isolates tested in 2016, down from 24.8% in 2015. Data shows that MRSA resistance to clindamycin and tetracycline has increased slightly, while resistance to trimethoprim-sulfamethoxazole continues to remain low.

Haemophilus influenzae resistance to ampicillin



Ampicillin resistance in *Haemophilus influenzae* isolates has been increasing since 2012, rising to 34.1% in 2016. These increases may be due to an increase in testing for resistance in this organism.

Research

Published

Utilization of Antibiotics in Long-Term Care Facilities in British Columbia, Canada

Marra F, McCabe M, Sharma P, Zhao B, Mill C, Leung V, Chong M, Patrick DM

Journal of the American Medical Directors Association, Volume 18, Issue 12 December 2017

Submitted manuscripts

A manuscript entitled **A retrospective analysis of prescribing rates in British Columbian children: Decreasing trends from 2004-2014** has been submitted for publication in the *Journal of Pediatrics*, outlining the decreasing trend of prescribing in children under the age of 20 in B.C.

Results of the program's cost analysis research have been submitted for publication in the peer-reviewed journal *Clinical Infectious Diseases* under the title **Cost-benefit analysis of a population-based education program on the wise use of antibiotics**.

$51.9 million	Patient cost savings
+	
$31.7 million	Pharmacare cost savings
=	
$83.6 million	Total savings in 2014

In total, **$449.6 million** has been saved on the cost of antibiotics between 2005 and 2014, representing a savings of **$76.20** for every **$1** spent on Community Antimicrobial Stewardship activities.

These results were presented at the AMMI Canada – CACMID Annual Conference 2018 held in Vancouver from May 2-5, 2018.

Impacts

The Community Antimicrobial Stewardship program's logic model outlines a number of measurable indicators of change representing the intended outcome's of the program's activities. While direct causation for these impacts cannot be attributed to the program, these achievements reinforce the value of the program's initiatives. An overview of the progress made on current impacts is listed in the table below. The Community Antimicrobial Stewardship program has recently updated its logic model, which has included identification of new priority impacts for the 2018/19 fiscal year and beyond.

Impact Measure	Achieved	Description
Reduction in overall use of antibiotics by 1 DDD per 1000 inhabitant days in B.C.	2012	A reduction in overall antibiotic use of 1 defined daily dose (DDD)/1000 inhabitant days compared to 2005 was first observed in 2012. Most recently, a total reduction of 1.42 DDD/1000 inhabitant days was observed in 2016 relative to 2005.
Reduction in use of newer macrolides by 20% in B.C.	2009	Prescription rates (prescriptions/1000 population/year) for macrolides declined by 20% as of 2009, and utilization rates (DDD/1000 inhabitant days) by 2012. In 2016, reductions have reached 38% and 39% compared to 2005, respectively.
Reduction in use of fluoroquinolones by 20% in B.C.	2014	Fluoroquinolone utilization (DDD/1000 inhabitant days) and prescription rates (prescriptions/1000 population/year) decreased by 21% compared to 2005 levels in 2014. In 2016, both rates are around 30% lower compared to 2005.
Reduction in prescriptions for bronchitis by 15% in B.C.	2009	A 15% reduction in prescription rates for bronchitis (prescriptions/1000 inhabitant days) was surpassed in 2009, which saw a 22% reduction that year compared to 2005. While rates increased slightly between 2014 and 2015, they continue to be 27% lower compared to 2005.
Reduction in prescriptions for otitis media by 15% in B.C.	2008	A 15% reduction in prescription rates for otitis media (prescriptions/1000 populations/year) relative to 2005 was first observed in 2008. Rates have continued to decline since, with a reduction of 39% observed in 2016 compared to 2005.

Conclusions

The Community Antimicrobial Stewardship program continues to be a leader in the field in Canada, providing a strong reference for other stewardship programs across the country.

Program components have been implemented to various degrees across the province over the past 13 years and continue to expand. A large number of children, adults and health professionals continue to receive teaching through the Do Bugs Need Drugs? program. Advertising through traditional media channels has built strong awareness of the program with the general public.

In addition, new approaches for reaching the public have been implemented. For example, the program's social media presence continues to grow and allows for more direct engagement with the target audience.

At the same time, engagement with health care professionals continues. Through ongoing collaboration with the Provincial Academic Detailing program, development of continuing education opportunities, and providing access to clinical resources such as the Bugs & Drugs reference guide, significant gains have been made in addressing the unnecessary and incorrect prescribing of antibiotics.

While the work completed in the past 13 years has had a significant impact on antimicrobial resistance in B.C. (and saved the public and government hundreds of millions of dollars), more work needs to be done to identify innovative ways to engage with the public and create partnerships with other public health programs. All program components need to be reviewed to ensure information continues to be up-to-date and relevant, and that objectives are still being met.

At the same time, worrying prescribing trends within numerous prescribing professions indicates that more targeted interventions are needed to continue to see positive impacts in antibiotic use and resistance in the province.

The indicators reflected in this report will continue to inform program planning in an attempt to further improve appropriate utilization of antibiotics, stabilize trends in antibiotic resistance, and ultimately minimize negative health outcomes.

References

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2 Goossens H, Ferech M, Vander SR, Elseviers M. Outpatient antibiotic use in Europe and association with resistance: a cross-national database study. *Lancet.* 2005; 365(9459):579-587.

3 Review on Antimicrobial Resistance. Tackling drug-resistant infections globally: final report and recommendations. https://amr-review.org/sites/default/files/160525_Final%20paper_with%20cover.pdf. Published May 19, 2016. Accessed May 25, 2018.

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5 Arnold SR, Straus SE. Interventions to improve antibiotic prescribing practices in ambulatory care. *Cochrane Database Syst Rev.* 2005;(4):CD003539.

6 Mixed Buy Transit Report. Lamar Advertising. Email Communication. April 18, 2018.

7 Google Analytics Report. Accessed May 1, 2018.

8 Bugs & Drugs. Alberta Health Services. http://bugsanddrugs.org. Updated January 25, 2018. Accessed May 25, 2018.

Acknowledgements

The Community Antimicrobial Stewardship team would like to thank the following partners for their continued support of the program:

- Do Bugs Need Drugs? program team and executive committee in Alberta
- Nursing students, early childhood education students and medical students involved in teaching the DBND curriculum
- B.C. Provincial Academic Detailing Pharmacists
- Child care resource and referral centre staff
- The Community Antimicrobial Stewardship Stakeholder Committee members including Walton Pang and Shirley Leung from the Ministry of Health
- LifeLabs Medical Laboratory Services and PharmaNet for providing vital data for this report

The Community Antimicrobial Stewardship program at the BCCDC is made possible by funding from the Ministry of Health – Pharmaceutical Services division.

The following community partners have been essential in providing the Do Bugs Need Drugs? educational curriculum: