



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

655 West 12th Avenue  
Vancouver, BC V5Z 4R4

Tel 604.707.2400  
Fax 604.707.2441

[www.bccdc.ca](http://www.bccdc.ca)

# *Do Bugs Need Drugs?* Annual Report

## 2016/17

Prepared by:

*Do Bugs Need Drugs?*  
June 30, 2017

***Do Bugs Need Drugs?***

**2016/17 Annual Report**

**June 30, 2017**

**Prepared for the  
British Columbia Ministry of Health,  
Medical Beneficiary and Pharmaceutical Services Division  
Drug Intelligence & Optimization Branch**

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## About this Report

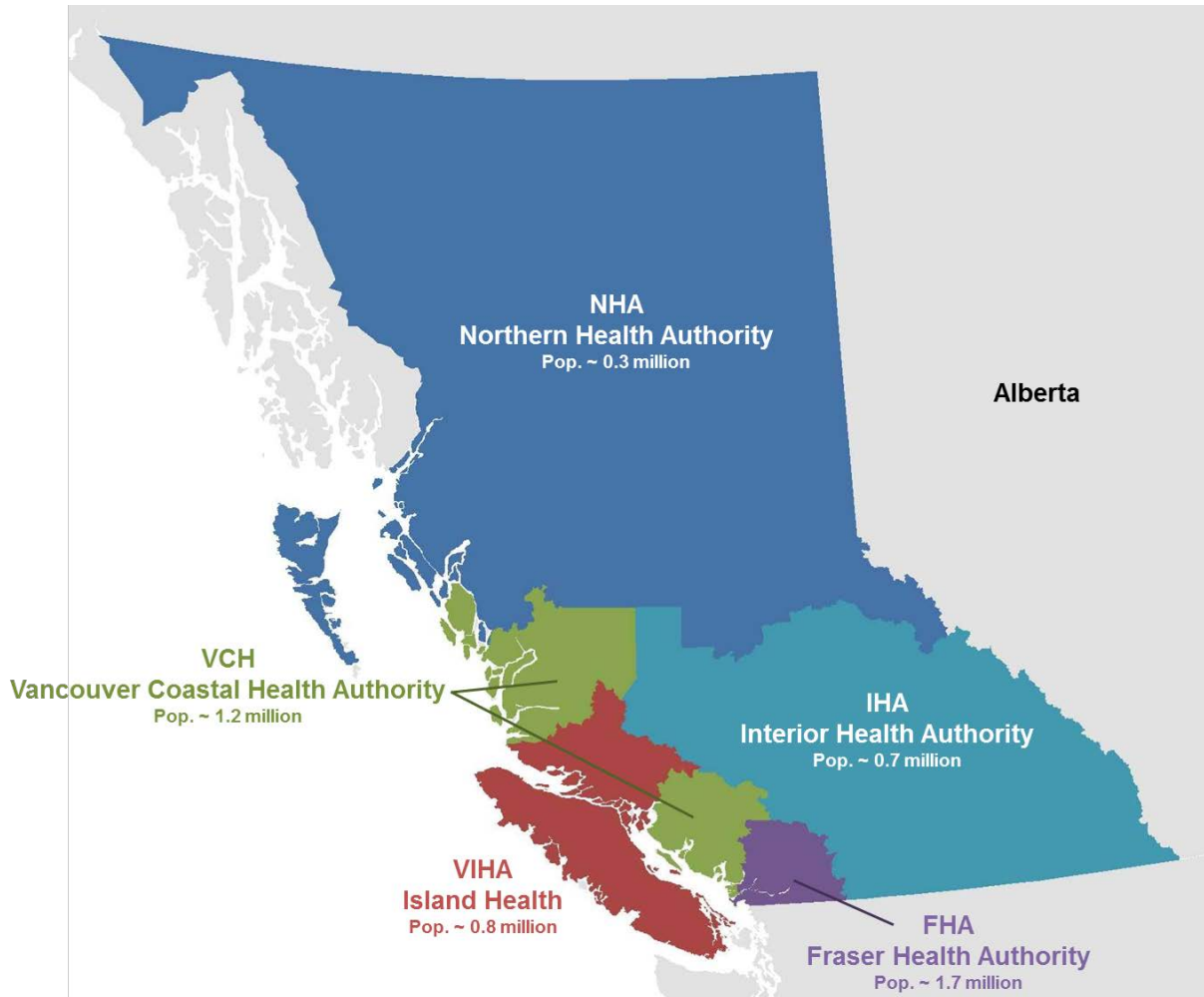
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The *Do Bugs Need Drugs?* (DBND) program is a multifaceted public and health care professional education program geared towards decreasing antibiotic overuse and misuse and the spread of resistant organisms. The DBND program was initially implemented in British Columbia (BC) in the fall of 2005, following the success of the program in Alberta. Since then, various components of the program have been established province-wide.

Evaluation of the DBND program includes Program Process Evaluation and Program Outcome Evaluation components. Program Process Evaluation is comprised of data collected around media campaigns, health care professional and public education programs, public teaching programs, print material distribution as well as indicators from social media outlets. Program Outcome Evaluation includes surveillance of trends in antimicrobial utilization and resistance in BC.

This report highlights program implementation and evaluation activities for the DBND program in BC for the 2016/17 fiscal year. Historical data from previous years' reports are presented to examine longer-term trends over time. Education activity numbers are presented by DBND education period (July to June). As program implementation numbers can vary considerably, scale bars on figures are not consistent across program components.

BC is divided into five regional health authorities: Interior Health (IHA), Fraser Health Authority (FHA), Vancouver Coastal (VCH), Island Health (VIHA), and Northern Health Authority (NHA) (**Figure 1**). Wherever possible, program implementation and evaluation numbers are presented separately for each Health Authority (HA).



**Figure 1.** Map of regional Health Authorities in BC, including 2015 population estimates  
(Source: BC Stats, accessed April 28, 2016)



## Acronyms

AMMI	Association of Medical Microbiology and Infectious Disease
AMR	Antimicrobial Resistance
AMS	Antimicrobial Stewardship
ATC	Anatomical Therapeutic Chemical
BC	British Columbia
DBND	<i>Do Bugs Need Drugs?</i>
DDD	Defined Daily Doses
DID	Defined Daily Doses per 1000 inhabitants per day
ECE	Early Childhood Educator
FHA	Fraser Health Authority
HA	Health Authority
IHA	Interior Health
K-3	Kindergarten to Grade 3
LTCF	Long term care facility
NHA	Northern Health Authority
PAD	Provincial Academic Detailing
PSA	Public Service Announcement
VCH	Vancouver Coastal Health
VIHA	Island Health (formerly Vancouver Island Health Authority)
VFS	Vancouver Film School

## Funding

The DBND program evaluation was originally funded by the Michael Smith Foundation for Health Research for two years, starting in June 2006. Ongoing evaluation is now funded on three-year funding cycles by the Medical Beneficiary and Pharmaceutical Services Division of the BC Ministry of Health as part of the overall DBND program implementation in BC. The current funding period ends March 2020.

## Executive Summary

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This report summarizes the evaluation of the *Do Bugs Need Drugs?* (DBND) program in British Columbia (BC) for the 2016/17 fiscal year. Since its implementation in BC in the fall of 2005, the DBND program has been a key public health initiative addressing the growing problem of antibiotic resistance in the province. Evaluation of the DBND program encompasses program process and outcome evaluation components.

### Program Process Evaluation

- This year's paid **public transit advertising campaign** ran from August 8 to September 5, 2016 in Kelowna, Victoria, Kamloops, Prince George and the Vancouver Lower Mainland, and was viewed an estimated 16 million times during this period in the Vancouver and Victoria areas. An additional four weeks of bonus advertising ran at no charge to the DBND program; several advertisements remained up past the bonus time until the space was re-allocated.
- The website, [www.antibioticwise.ca](http://www.antibioticwise.ca), was created to support the 2016 media campaign initiatives, as well as to direct the public to specific information that aligned with the campaign messages. This website is user friendly, mobile friendly, and has current, relevant content for the public. A search feature displaying whether antibiotics are needed for common conditions/illnesses, as well as an interactive quiz that can be shared with others were additions this year.
- The **television advertisement campaign** ran for a seven week period between January and March 2017 and featured one 15-second advertisement focusing on antibiotics being weapons that are used to fight bacterial infections, and if taken when not necessary, subsequent infections may be resistant. The advertisement encouraged people to talk with their doctor the next time they're prescribed antibiotics. Regional market coverage included the Vancouver Lower Mainland, Victoria and province-wide coverage. The number of TV spots **over** delivered by 14% when compared to the number of purchased spots.
- The **digital display campaign** ran for a 7 week period and included demographic targeting and contextual targeting, directing users to the antibioticwise.ca website to learn more. These advertisements delivered over 5.9 million impressions with 9,513 clicks to the antibioticwise.ca website over the time period.
- Two **Facebook marketplace advertisements** ran between January and March to reach our target demographic of women 25-54 and mothers with children 1 to 17 years of age, directing them to the antibioticwise.ca website to learn more. These advertisements delivered over 4.2 million impressions with 9,622 clicks to the antibioticwise.ca website over the time period.
- A Google Adwords campaign had 1,759 clicks and served as a strong awareness tactic, delivering 224,247 impressions – 49% higher than planned numbers and also delivering our key objective of awareness.
- Overall, 72% of women aged 25-54 in British Columbia saw the Antibiotic Wise message an average of 8 times.
- Overall, 87% of women aged 25-54 in Vancouver saw the Antibiotic Wise message an average of 15 times.
- The DBND Facebook page was launched in September 2015. As of March 31 2017, there have been approximately 330 people "like" the page, with a post reach of 3,780,000 people. The DBND

Twitter handle was launched in August 2014 and had 980 followers as of March 31, 2017. The Antibiotic Wise Twitter handle was launched July 20, 2016, and had 168 followers as of March 31, 2017.

- Collaboration with the Provincial Academic Detailing (PAD) pharmacists in BC on asymptomatic bacteriuria (specifically in the elderly). Between June 2016 and May 2017, PAD engaged over 130 long-term care facilities (LTCF) to provide information and guidance on management of asymptomatic bacteriuria in residents. The purpose of this work was ultimately to minimize inappropriate administration of antibiotics to treat these indications.
- A total of 67 health care professional education sessions were held during the 2016/17 DBND education period, including 34 **Continuing Education** sessions with health care professionals, and 25 **Train-the-Trainer** sessions to teach health care professionals and students how to deliver the DBND public teaching components.
- During the 2016/17 DBND education period, 422 public teaching sessions were taught to over 9,300 individuals across the province. By program component, 58 **Daycare** sessions were taught to 990 children; 212 **Grade 2** sessions were taught to 4,847 children; 66 **General Teaching** sessions were taught to 1,871 individuals; 63 sessions under the **K-3 Teacher Resources** component were provided to 1,666 children; and 23 **Older adult** sessions were taught to 411 staff, residents and visitors in long-term care.
- In 2016, over 32,000 **print materials**, including activity placements, stickers, signs and posters, parent guides, and pamphlets, were distributed across the province.
- The **Bugs and Drugs iPhone app** has been distributed to 3,000 health care professionals as of September 15, 2016. We worked with Alberta Health Services to make Bugs and Drugs online version ([www.bugsanddrugs.org](http://www.bugsanddrugs.org)) available to BC practitioners March, 27, 2017. From May 19 to June 18, 2017, users have logged 2,007 sessions on the online version.

## Program Outcome Evaluation

- The DBND program has launched interactive data visualization tools on the BCCDC website that presents and summarizes data previously captured in the static annual antimicrobial utilization and resistance reports. These “Antimicrobial Surveillance Dashboards” allow for improved accessibility to information for healthcare professionals and the public, and can be found here: <http://www.bccdc.ca/health-professionals/data-reports/antimicrobial-surveillance-tools>
- Antimicrobial utilization trends remain generally consistent to previous years with the addition of 2014 PharmaNet data
- Examination of utilization trends in long-term care facilities (LTCF) show that rates are nearly double that of BC’s overall population at around 30 DDD/1000 residents/day, reinforcing the necessity of targeted activities led by PAD, AMMI, and DBND
- Knowledge obtained from Dr. Patrick’s visit to a number of Australian health centres involved with antimicrobial stewardship initiatives will be used to inform future program process and outcome evaluation activities.
- Further to DBND’s past collaboration with the Public Health Agency of Canada/National Microbiology Laboratory to support the establishment of Canadian Antimicrobial Resistance

Surveillance System (CARSS), a report was released in the fall of 2016 of outlining findings and identifying areas for improvement:

<https://www.canada.ca/en/public-health/services/publications/drugs-health-products/canadian-antimicrobial-resistance-surveillance-system-report-2016.html>

- Several logic model impact goals have been achieved since 2005, and a revision of impacts is underway

## Introduction

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Human antibiotic use is a known driver of antibiotic resistance.<sup>1,2</sup> Although antibiotic resistance is a naturally occurring biological phenomenon, it has been exacerbated by the abuse, overuse and misuse of antibiotics. 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 BC.<sup>3</sup> 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.

Various interventions have been implemented in an effort to improve judicious antibiotic use and to reduce inappropriate use. These interventions can be generally classified as those targeting changes in prescribing behaviour among prescribers and patients,<sup>4,5,6</sup> public health campaigns to raise awareness about antibiotic resistance and inappropriate antimicrobial therapy,<sup>7</sup> and administrative restrictions and policies such as formulary restrictions.<sup>8,9</sup> The most successful results appear to be associated with multifaceted interventions, specifically those combining physician, patient, and public education through a variety of venues and formats.<sup>5</sup>

### Do Bugs Need Drugs? Program

The *Do Bugs Need Drugs?* (DBND) program is a multifaceted public and health care professional education program geared towards decreasing antibiotic overuse and misuse and the spread of resistant organisms ([www.dobugsneeddrugs.org](http://www.dobugsneeddrugs.org)). The program focuses on providing educational material, presentations, and workshops centred around three key messages to the public and health care professionals in the community:

1. **Wash your hands!** Hand washing is the best way to stop the spread of infections.
2. **Not all bugs are created equal.** Antibiotics work against bacteria, but not against viruses.
3. **Use antibiotics wisely!** Bacteria can become resistant to antibiotics.

The DBND program was initially implemented in British Columbia (BC) in the fall of 2005, following the success of the program in Alberta. Since then, various components of the program have been established province-wide. The current report highlights program implementation and evaluation activities for the DBND program in BC for the 2016/17 fiscal year.

Evaluation of the DBND program includes two main components: **Program Process Evaluation** and **Program Outcome Evaluation**. Process evaluation includes surveillance of program implementation and scope including monitoring media reach, health care professional and public education, program teaching numbers, and print material distribution. Outcome evaluation is currently comprised of surveillance of antimicrobial utilization and resistance trends in the province of BC. Ongoing evaluation of the DBND program is necessary to assess the impacts of this program, direct future efforts, and ensure continued public benefit.

The DBND evaluation objectives of 2016/17 were to measure the following:

1. **Program Implementation.** Tracking and evaluating the progress of the different components and efforts of the program, including the number of health care professionals and members of the public exposed to various components of the program.
2. **Trends in Antimicrobial Utilization.** Epidemiological analysis of trends in antimicrobial utilization over time with respect to overall use of antibiotics, overuse of specific antibiotic classes, and misuse of antibiotics for common infections when they are not required.
3. **Trends in Antimicrobial Resistance.** Updates from the annual “Antimicrobial Resistance Trends in the Province of British Columbia” report, which monitors trends in antimicrobial resistance among key organisms.

### Knowledge Translation and Dissemination Activities

Each year, the DBND program prepares annual surveillance reports to monitor trends in antimicrobial utilization and resistance in BC. These reports are intended to inform the Ministry of Health, health care professionals, and the general public about our surveillance and outcome evaluation activities. Annual reports include the “British Columbia Annual Summary of Antibiotics Utilization” and “Antimicrobial Resistance Trends in the Province of British Columbia.” The most recent versions of these reports are available at: [www.bccdc.ca/dbnd](http://www.bccdc.ca/dbnd). Updated versions of these reports are anticipated later this year.

Peer-reviewed publications related to the DBND program included the following:

- Award of Distinction from the Canadian Journal of Infectious Diseases & Medical Microbiology for the article entitled “Value of an aggregate index in describing the impact of trends in antimicrobial resistance for *Escherichia coli*” for the high quality of the paper and its findings.

Non-peer-reviewed publications related to the DBND program included the following:

- Article for the BC Dental Association (BCDA) member magazine, *the bridge*, published and circulated to BC dentists



do\_bugs\_need\_drugs\_P2.pdf

- David Harris, Infectious Diseases Resident from McMaster University working with DBND for one month to write the BCDA member magazine article and collaborate with the BCDA on a patient education pamphlet
- Article posted in Journal of the American Dental Association on why dental prescribing of antibiotics is increasing



JADA\_307\_Antibiotic Prescribing by Dentist

- Short article “BC Physicians Reduce Unnecessary Antibiotic Use ... and Costs” published in November issue of BCMJ.



BCMJ\_Vol58\_No9\_bc  
\_cdc.pdf

National initiatives supported:

- Promoted Antibiotic Awareness Week in health authority newsletters, on DBND website and social media channels.
- Promoted the launch of the AMMI national campaign to stop inappropriate antibiotic use for asymptomatic bacteriuria with community partners and stakeholders.

Conference presentations included:

- BCCDC Research Week 2016 oral and poster presentation on antimicrobial data visualization tool

News/Forums with DBND contribution:

- Dr. Patrick attended a national antibiotic stewardship roundtable June 16 and 17, 2016, where there was keen interest by government and indications that the national agenda should move forward over the next year.
- Issued fall press release during Antibiotic Awareness week, including a brief overview of some of our findings and successes with the program. Eleven media outlets provided coverage.
- Dr. Blondel-Hill represented the DBND program at the WHO Expert Consultation on Health Workforce Education and Antimicrobial Resistance March 23 – 24, 2017.

Educational Initiatives with DBND contribution:

- Ongoing focus on the dental profession to understand and change patterns of excessive use.
  - Dental patient education resource finalized with the BCDA, DBND and CDA input and posted on the BCDA website; CDA to share with other provinces (<http://bcdental.org/YourDentalHealth/YourDentalHealth.aspx?id=13535>)
  - The national survey of dentists, built by the faculty of dentistry in Toronto in collaboration with the DBND program, the CDA and BCDA, was sent out to all dentists as a web based survey in March, 2017. The survey assesses antibiotic usage within dental practices. The survey has been built by the faculty of dentistry in Toronto and asks questions around both antibiotic prophylaxis and treatment for tooth extractions and implants and dental cleaning.
  - Worked through AMMI Canada, CDA and Orthopedics to create a statement built on evidence that perioperative prophylaxis for those with prosthetic joints is not required
- Ongoing focus on LTC facilities to understand and change patterns of excessive use.
  - Collaboration with PAD Pharmacists on educating staff and physicians in LTC. Education sessions were provided to healthcare providers at 131 of BC's long-term care facilities regarding appropriate antibiotic utilization for UTI/asymptomatic bacteriuria.

- Presentation to College of Licensed Practical Nurses of BC articulation meeting, asking them to consider including UTI in LTC content into their curriculum. They are considering adding this as best practice.
- Content included on UTI and asymptomatic bacteriuria in educational sessions to nursing students who participate in the implementation of DBND programs in the community.

## 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 BC through public and professional education and an increase in proper antibiotic prescribing practices ( **Figure 2**). 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 Program Outcome Evaluation section (**page 36**).

Resources	Program Processes	Process Outputs	Program Outcomes	Outcome Measures	Impact
Funds and endorsement for the program from the Ministry of Health	Coordinate delivery of program key messages and components				
Educational materials from Alberta Health Services	Media Campaign	Television Advertisement(s)	Timing and reach of media campaigns	Increased public knowledge that viral infections do not require antibiotic therapy	Stabilization of or decrease in antimicrobial resistance in BC
		Children's initiatives			
Contribution from health care professionals, health care students, and ECE staff	Print Materials Distribution	Transit Advertisement(s)	Amount of print material distributed	Decrease in public requesting antibiotics	Reduction in overall use of antibiotics by 1 DDD per 1000 inhabitant days in BC
		Social media (websites, Twitter, Facebook, digital ads)			
Program committee consisting of: physicians (e.g. medical lead), microbiologists, nurse (program coordinator), epidemiologist, pharmacist, administrative assistant, infectious disease specialists	Public Education	Washroom posters	Number and locations of community partners taught to deliver the program	Increased awareness and practice of proper hand-washing	Reduction in use of newer macrolides and fluoroquinolones by 20% in BC
		Parent guides, pamphlets, posters, stickers			
Collaboration with external groups	Healthcare Professional Education	Training and delivery of: Daycare Program, Grade 2 Program, K – Grade 3 Teacher Resources, General Teaching, Older Adult Program	Number and region of children and older adults taught	Integration of antimicrobial stewardship in community practice	Health Care Professional Knowledge and Attitude Change Surveys
		Community events			
Collaboration with external groups	Surveillance, Research, Intervention, Evaluation, Collaborations	Bugs and Drugs Guide, Continuing Education for Physicians, Pharmacists, and others	Number and locations of healthcare professional education sessions and participants	Decrease in physicians prescribing antibiotics for suspected viral infections	Antibiotic Resistance Analyses
		Train-the-Trainer, Education for Daycare, Grade 2, and Older Adult programs			
Collaboration with external groups	Surveillance, Research, Intervention, Evaluation, Collaborations	Antibiotic Resistance and Utilization Surveillance Dashboards	Annual Report	Increased use of first line antibiotic agents	Linked PharmaNet, MSP, and DAD Data Analysis
Collaboration with external groups	Surveillance, Research, Intervention, Evaluation, Collaborations			Change in prescription patterns for antibiotics	PharmaNet Data Analysis

**Figure 2.** Program logic model (edited May 2017)



# Program Process Evaluation

## Media Campaign

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The DBND media campaign is composed of several advertisement components: 1) public transit, 2) television, 3) digital display and Facebook marketplace advertisements, 5) Google Adwords, and 6) social media (Twitter, Facebook, the DBND website and the antibioticwise.ca website). Since implementation in 2006 (television) and 2007 (public transit), media campaigns have been run on an annual basis. The target audience for these campaigns is women aged 25-54, with secondary target audiences including men aged 25-54, teachers and educators, as well as doctors and other health care professionals.

### Public Transit Advertisements

As the shift in media as a mode of communications occurs, more resources will be directed from transit advertisements towards digital activities. The 2016 public transit advertising campaign ran for 8 weeks between August 8 to September 5, 2016 in Victoria, Kelowna, Kamloops, Prince George and the Vancouver Lower Mainland. Four additional weeks of advertising ran after those dates at no charge to the DBND program with many advertisements remaining in use until the space was re-allocated to another client. A total of 60 advertisements were posted on bus exteriors during this year's campaign: 40 advertisements in the Vancouver Lower Mainland, 6 advertisements in Kelowna, 9 advertisements in Victoria, 3 advertisements in Kamloops and 2 advertisements in Prince George.<sup>10</sup> New graphics were designed in collaboration with communications specialists for the fall 2016 campaign.

- This year's paid **public transit advertising campaign** ran from August 8 to September 5, 2016 in Kelowna, Victoria, Kamloops, Prince George and the Vancouver Lower Mainland, and was viewed an estimated 16 million times during this period in the Vancouver and Victoria areas alone. An additional four weeks of bonus advertising ran at no charge to the DBND program; several advertisements remained up past the bonus time until the space was re-allocated.

### Television Advertisements

The television advertisement campaign ran for a seven week period between January and March, 2017. The 2017 campaign featured a 15-second television advertisement, focusing on antibiotics being weapons that are used to fight bacterial infections, and if taken when not necessary, subsequent infections may be resistant. The advertisement also encouraged people to talk with their doctor the next time they're prescribed antibiotics. Regional market coverage included the Vancouver Lower Mainland, Victoria and province-wide coverage.

Target audience reach and average viewing times among women in British Columbia aged 25-54 by regional market are provided in **Table 1**.<sup>11</sup> The number of TV spots over delivered by 14% when compared to the number of spots purchased. This includes Public Service Announcements (PSA) spots, as well as bonus spots, both delivered at no cost to the program. An estimated 13 million television advertisement views occurred by BC women aged 25-54.

### Online Display and Facebook Marketplace Advertisements

Three online banners were created and used for the Online Display campaign to target behaviours and the audience of interest and re-direct users to the Antibiotic Wise website. Online user activities were collected anonymously with no personally identifiable information to create user personas or profiles that were used to segment the audience into certain groups based on demographics or context (e.g. women

25-54, mothers with children aged 1-17, searches for antibiotic awareness). People with similar online behavior were grouped together into one segment and shown advertisements that cater to their interests (e.g. Be antibiotic wise banners). The Online Display ads delivered 5.9 million impressions over the seven weeks that the campaign ran and exceeded the purchased number of impressions by 12%.

Similarly, Facebook marketplace ads were purchased and were targeted to the audience of interest. The two ads were designed to drive users to the Antibiotic Wise website. Overall the Facebook marketplace ads delivered 4.2 million impressions over the seven week campaign and exceeded the purchased number of impressions by 25%.

**Table 1.** Target audience reach and average viewing times among women aged 25-54 in British Columbia January 23 – March 12, 2017.

<b>Media</b>	<b>Percent of Target Audience Reached</b>	<b>Average Number of Times Viewed / Campaign Period</b>
Digital	70-75%	8.0 views / 7 weeks
Television	65 - 70%	11.0 views / 7 weeks
<b>Digital and television initiatives combined</b>	<b>75%</b>	<b>16 views / 7 weeks</b>

## Google Adwords

Search Engine Marketing was used to build awareness and drive clicks to [www.antibioticwise.ca](http://www.antibioticwise.ca). The 7 week campaign served as a strong awareness tactic, delivering 224,247 impressions, 49% higher than planned, and resulting in 1,759 clicks to the Antibiotic Wise website.

## Social Media Initiatives

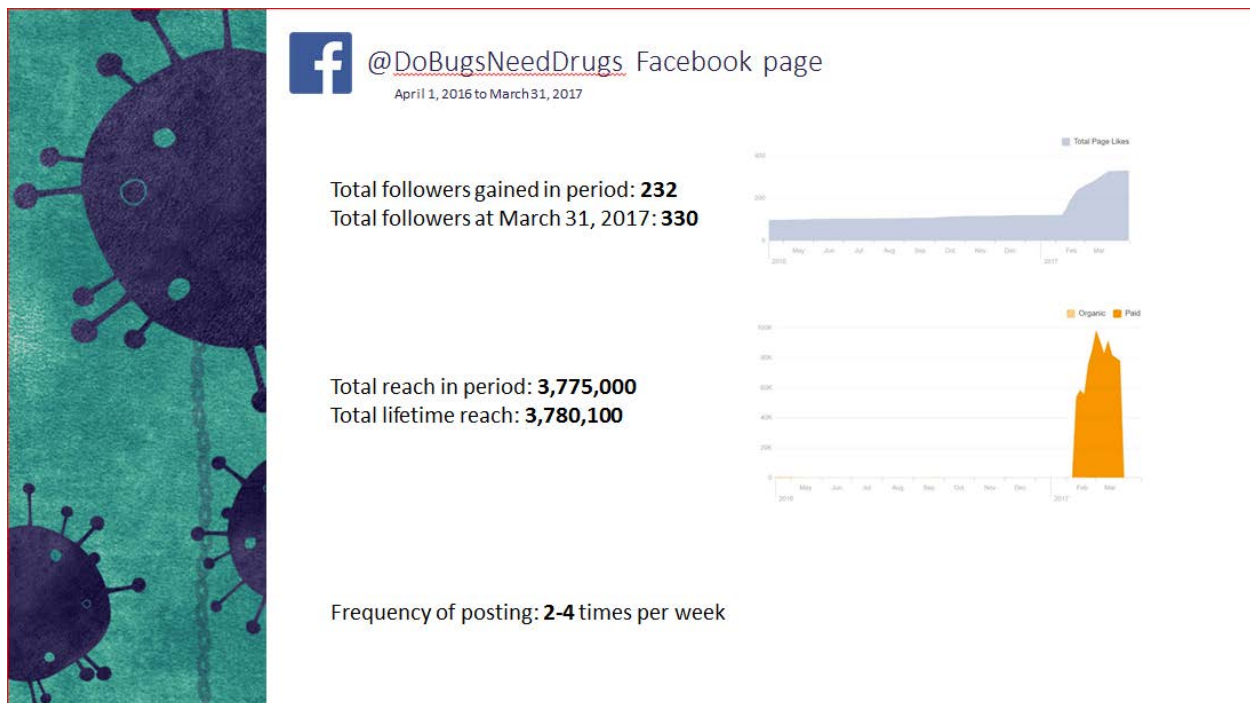
This *The Do Bugs Need Drugs?* program has continued enhancing its presence in social media to connect with online audiences and increase awareness of the program, its initiatives, and materials.

Social media provides the DBND program with the opportunity to educate the public and enlist the audience in disseminating key messages. The messages of DBND are amplified and endorsed through the social sharing of content and information within the network. Online media consumption has increased over the years with a substantial portion of this consumption occurring within social networks or involving a social media component (which facilitates easy sharing through social media). Social media has the unique ability to facilitate direct engagement with the audience and moves away from the exclusive use of push messaging employed by traditional media such as television, radio, and print.

### Facebook

September 11, 2015 marked the launch of the DBND Facebook page. The Facebook page features videos, links and news articles related to antibiotic use or resistance, and is updated frequently, as relevant information becomes available. By the end of March, 2017, the page had a potential reach of 3,780,100 people and 330 likes.

Cross-posting DBND? Twitter content to Facebook has allowed for the establishment of brand presence on Facebook without resource-intensive platform-specific content creation. Driven largely by a successful 7 week (*January 23 to March 12, 2017*) Facebook advertising campaign in January, February and early March, program materials reached over 3.7 million Facebook users and precipitated a **337%** increase in followership. Despite the growing trend of Facebook page performance relying on higher and higher advertising expenditure thresholds (the pay-to-play trend), the DBND Facebook page continues to perform at or above industry standard for Page reach and various engagement metrics.

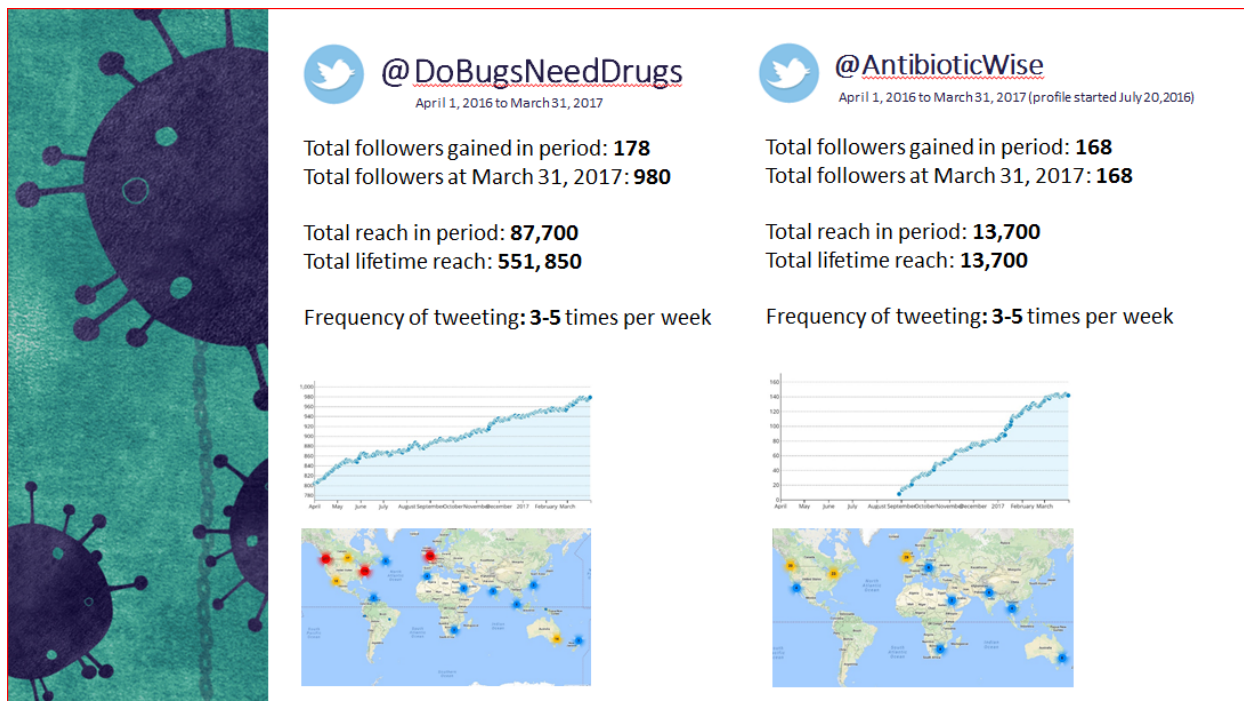


## **Twitter**

Since DBND began its Twitter feed in August 2014, a steady increase in followers has been noted. As of March 31, 2017, the DBND Twitter handle had 980 followers with a total lifetime potential reach of 551,850 (i.e. the cumulative number of followers of those following the DBND Twitter handle). Tweets were viewed an estimated 87,700 times between April 1 and March 31, 2017. The Antibiotic Wise Twitter handle, launched July 20, 2016, had 168 followers as of March 31, 2017, with a total lifetime potential reach of 13,700.

The DBND program continues to build on its existing digital presence, and focused on fostering a community of online advocates to assist disseminating program content. During the period, the AntibioticWise Twitter handle was also established to provide a social media presence for the Antibiotic Wise website to accompany the main DBND program messaging. Social media resources were reconfigured to support the priorities of engagement and outreach for both social media accounts, in addition to the ongoing goal of increasing followership. Engaging community advocates in real-time and genuine conversations has added brand value and recognition within the established community of

advocates, perhaps best characterized by a **23%** increase in engagement rate for the DBND content and **14%** increase in engagement rate for AntibioticWise content across the reporting period.



### ***DBND and Antibiotic Wise Websites***

The DBND website ([www.dobugsneeddrugs.org](http://www.dobugsneeddrugs.org)) was originally created by the Alberta DBND program in 1998 and updated in 2012. The website contains information for healthcare professionals, teachers, childcare workers and the public. The grade 2 and daycare program material, translated material, and links to other relevant websites are provided; games and puzzles are also featured for children. In addition, a tutorial slide show is available for training sessions for nursing students and childcare workers. During the 2016/17 fiscal year, the DBND program saw an increase in traffic to the website compared to the previous year; a 10% increase in the number of sessions and a 6% increase in users were noted.<sup>12</sup> Typically, traffic subsides during the summer months when schools are closed and thus public teaching sessions are not commonly held, though this was less pronounced in 2016/17 than in previous years (**Figure 3**). In contrast, a gradual increase can be observed starting September as both public teaching and healthcare professional education sessions resume.

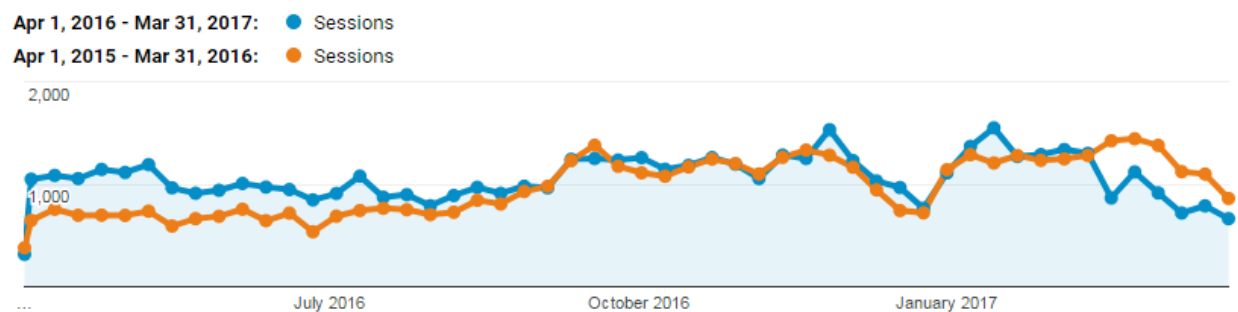
In 2016, a BC-specific website was developed in collaboration with communications specialists in order to fulfill funding requirements to better align the BC campaign with the website. The new website was launched February 15, 2016 and supports the BC media campaign initiatives, as well as directing the public to specific information that aligns with campaign messaging. The new website,

([www.antibioticwise.ca](http://www.antibioticwise.ca)) is designed to be user friendly, mobile friendly, and contains current and relevant content for the public including: information about antibiotics – what they are; common uses; when to use/not to use; safety; what the public can do; an antibiotic checklist with questions to ask the physician; a quiz; a frequently asked question page; information about what antibiotic resistance is; current issues; statistics; a prevention page; and a resource page for the public and for professionals with links to the DBND website ([www.dobugsneeddrugs.org](http://www.dobugsneeddrugs.org)).

Due to a shift in media campaign timing (January 23 – March 12, 2017 versus February 15 – April 24, 2016), direct comparison to the media campaign implemented in 2016 was not feasible. However, when comparing January 1 - April 30 of both years, sessions decreased by 18% and users by 19% in 2017 compared to the same time period in 2016 (**Figure 4**)<sup>12</sup>.

During the media campaign, 9,817 users visited the Antibiotic Wise website (a 21% increase compared with the 2016 campaign period). This year, the vast majority of users accessed the website on a mobile device (84%), a 200% increase in mobile users compared with the 2016 campaign period. From the website's launch to March 31, 2017, there have been a total of 22,640 sessions (**Figure 5**). As seen in **Figure 5**, traffic levels increase dramatically during active campaign periods.

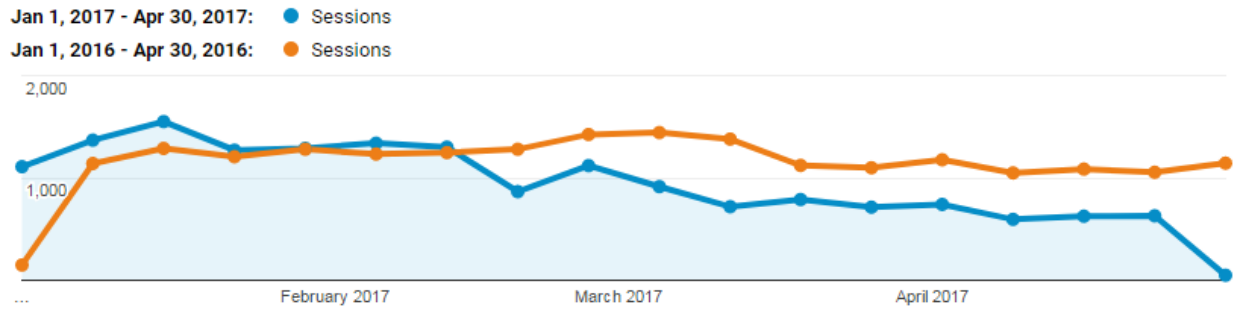
Additions to the Antibiotic Wise website this year include a search feature whereby users can specify a common condition/illness resulting in a message specifying whether antibiotics are needed or not (**Figure 6**), as well as an interactive quiz testing knowledge of hygiene and antibiotic use that can be forwarded to others after completion.



**Figure 3.** Number of sessions\* per week on the *Do Bugs Need Drugs.org* website between April 1, 2015 and March 31, 2017\*\*

\* A session is defined as any active engagement with the website (screen views, events, etc.) until a 30 minute window of inactivity occurs

\*\* Note that low data points at beginning or end of this period represent incomplete weeks



**Figure 4.** Number of sessions\* per week on the *Do Bugs Need Drugs.org* website between January 1 and April 30 in 2016 and 2017\*\*

\* A session is defined as any active engagement with the website (screen views, events, etc.) until a 30 minute window of inactivity occurs  
 \*\* Note that low data points at beginning or end of this period represent incomplete weeks



**Figure 5.** Number of sessions\* on the Antibiotic Wise website between January 1, 2016 and March 31, 2017

\* A session is defined as any active engagement with the website (screen views, events, etc.) until a 30 minute window of inactivity occurs

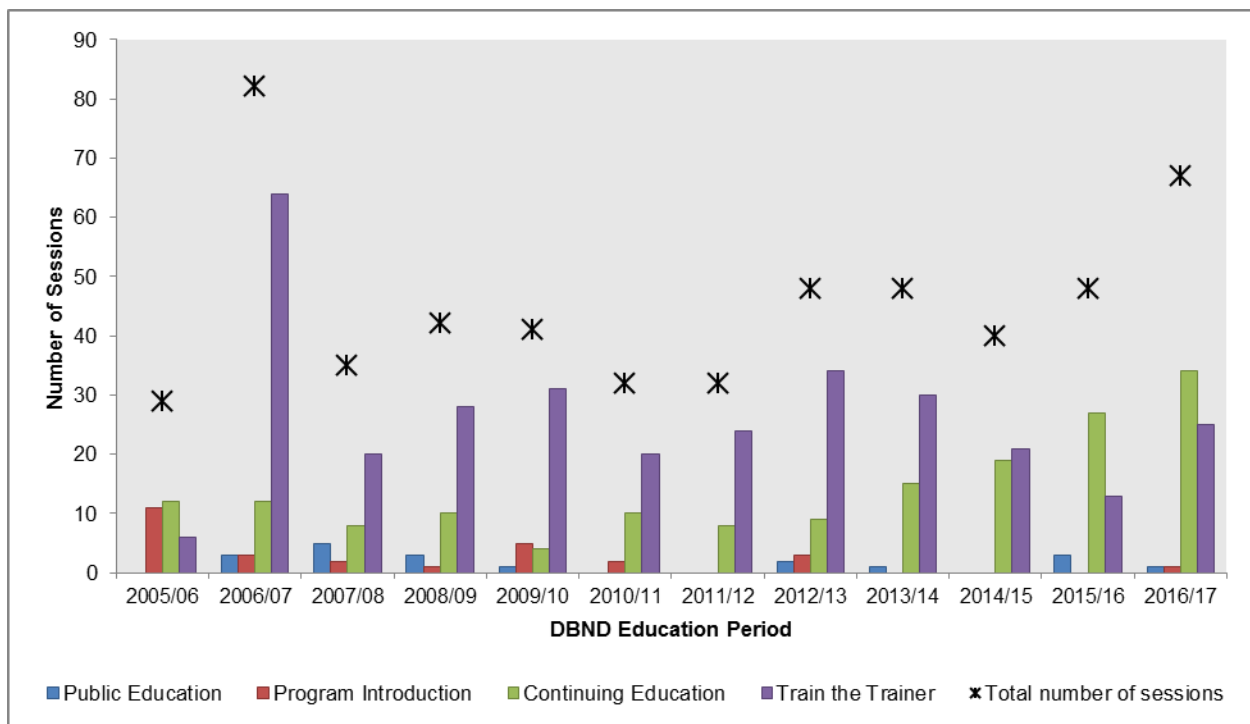


**Figure 6.** New user search feature on Antibiotic Wise website specifying whether antibiotics are required for common conditions/illnesses.

## Health Care Professional and Public Education

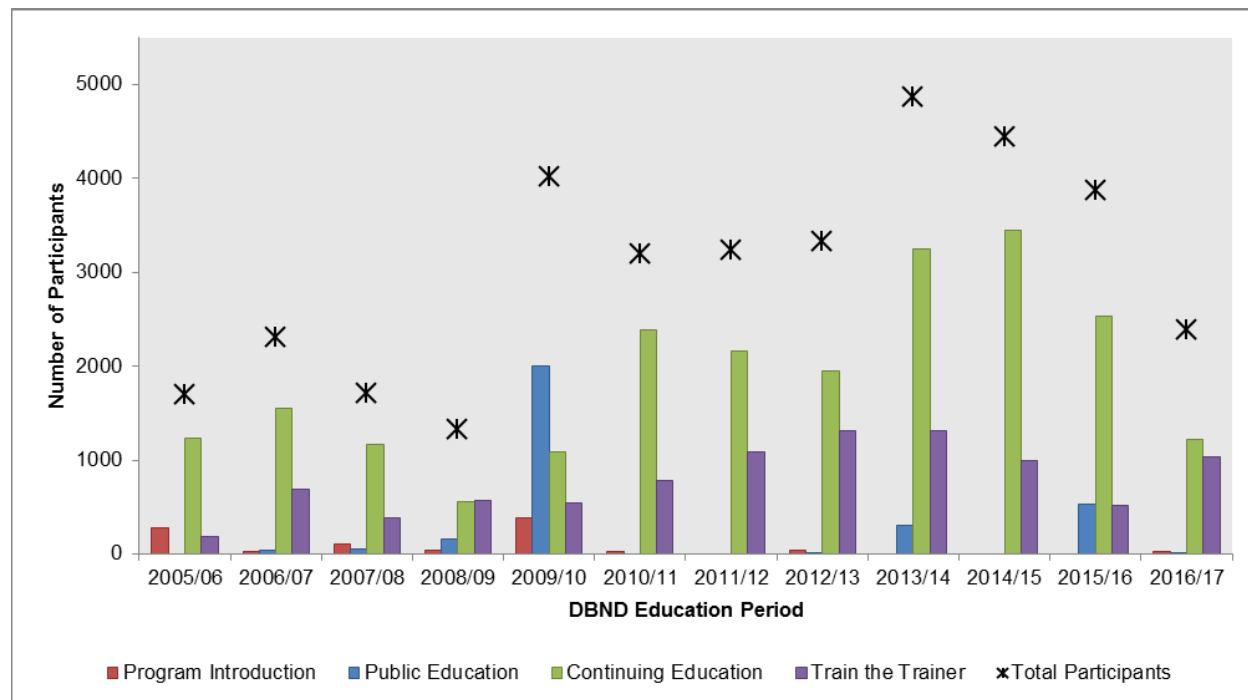
Health care professional and public education within the DBND program is comprised of several components, including Public Education, Program Introduction, Continuing Education, and Train-the-Trainer. These components are described in more detail below.

Education sessions are often attended by various types of audiences. Individuals considered target audience members for the DBND program and its key messages are included in the results presented below. Estimated attendance numbers for other audience members are included as footnotes to the tables or figures where relevant.



**Figure 7.** Number of education sessions by type of session and DBND education period, 2005/06 to 2016/17<sup>†</sup>





**Figure 8.** Number of participants attending education sessions by type of session and DBND education period, 2005/06 to 2016/17<sup>†</sup>

\* The large number of public education participants during the 2009/10 fiscal year represents educational activities provided as part of the Vancouver International Children’s Festival.

<sup>†</sup>Only target audience participants are included in the figure; a total estimate of 1838 individuals have participated in sessions as other audience members since program inception in BC.

## Public Education and National/International Action

The Public Education sessions are provided by DBND team members, in conjunction with media initiatives, and are targeted towards members of the general public throughout the entire year. These sessions are a means of providing an overview of the DBND program and its three key messages as well as distributing print materials. Since implementation of the DBND program during the 2005/06 fiscal year, 19 Public Education sessions have been held (**Figure 7**). These sessions were attended by a total of 3,107 participants to date (**Figure 8**).

National activities during the 2016/17 DBND education period included biweekly meetings for a two-month period to discuss the national AMMI campaign to reduce overuse of antibiotics for asymptomatic bacteriuria. In addition, DBND participated in two panel presentations discussing the public health role in antimicrobial stewardship at the 2017 Canadian Public Health Association Conference. International activities included four continuing education sessions, two consultations at strategy sessions, and one program introduction session at Australian educational institutions and health centres.

## Program Introduction

Program Introduction sessions are held with various academic and health care institutions in order to introduce the DBND program and solicit interest in becoming affiliated with the DBND program for training and program delivery purposes. Since program implementation, 28 Program Introduction sessions have been held (**Figure 7**). These sessions were attended by a total of 929 participants (**Figure 8**). Program Introduction sessions were not commonly conducted since 2013/14 as the program has become well established in the province. However, one Program Introduction sessions was held in 2016/17 for international colleagues at the University of Queensland in Queensland, Australia.

## Continuing Education

Continuing Education sessions are designed to deliver the DBND program to health care professionals, including physicians, pharmacists, nurses, and infection control practitioners. Sessions include accredited Continuing Medical Education (CME) sessions as well as oral and poster sessions at provincial, national, and international conferences. Since program implementation, DBND team members have attended 168 Continuing Education sessions (**Figure 7**). An estimated 22,543 health care professionals attended these sessions or were potentially exposed to components of the DBND program since 2005/06 (**Figure 8**). In 2016/17, DBND team members presented at 34 Continuing Education sessions with an estimated attendance of 1,226 health care professionals, the majority (61%) of whom were physicians (**Table 2**).

From June 2016 to May 2017, the Provincial Academic Detailing (PAD) pharmacists in BC conducted an education-based intervention among health care professionals of long term care facilities regarding inappropriate use of antibiotics to treat asymptomatic bacteriuria among the elderly. A total of 131 publicly subsidized long term care facilities were visited, and 745 sessions conducted.

## Train-the-Trainer

Train-the-trainer sessions are conducted with health care professionals and students to provide program introduction and training required for delivery of the public teaching program components. Since program implementation, 316 Train-the-Trainer sessions have been held (**Figure 7**). A large number of Train-the-Trainer sessions were provided during the initial phases of program implementation; since then, Train-the-Trainer sessions have been sustained at a more constant level. In total, 9,404 participants have attended Train-the-Trainer sessions (**Figure 8**). During the 2016/17 fiscal year, 25 Train-the-Trainer sessions were provided to 1,040 participants. The majority of these participants were nursing students or instructors (70 %) (**Table 2**).

**Table 2.** Number of target audience participants by target audience and year, 2016/17 DBND education period\*

<b>Target Audience*</b>	<b>Continuing Education n (%)</b>	<b>Train the Trainer n (%)</b>
Public	-	-
Assisted Living Staff	-	-
Dentists or Dental Students	90 (7)	
Early Childhood Educators		
ECE Students or Instructors		15 (1)
Medical Students	112 (9)	288 (28)
Nurses	97 (8)	
Nursing Students or Instructors		731 (70)
Pharmacists		
Pharmacy Students		
Physicians**	750 (61)	
Other Health Professionals	97 (8)	
More than one main target audience†	60 (5)	
<b>TOTAL</b>	<b>1226 (100)</b>	<b>1040 (100)</b>

\*Only target audience participants are included in the table; a total of 148 individuals have participated in health care professional and public education sessions as other audience members during the 2016/17 fiscal year.

\*\* One "Program Introduction" session was conducted in 2016/17 with 20 physicians in attendance (not shown)

†At certain events, a variety of healthcare professionals (i.e. a combination of professionals listed) were in attendance as target audience members

ECE = Early Childhood Education.

## Public Teaching

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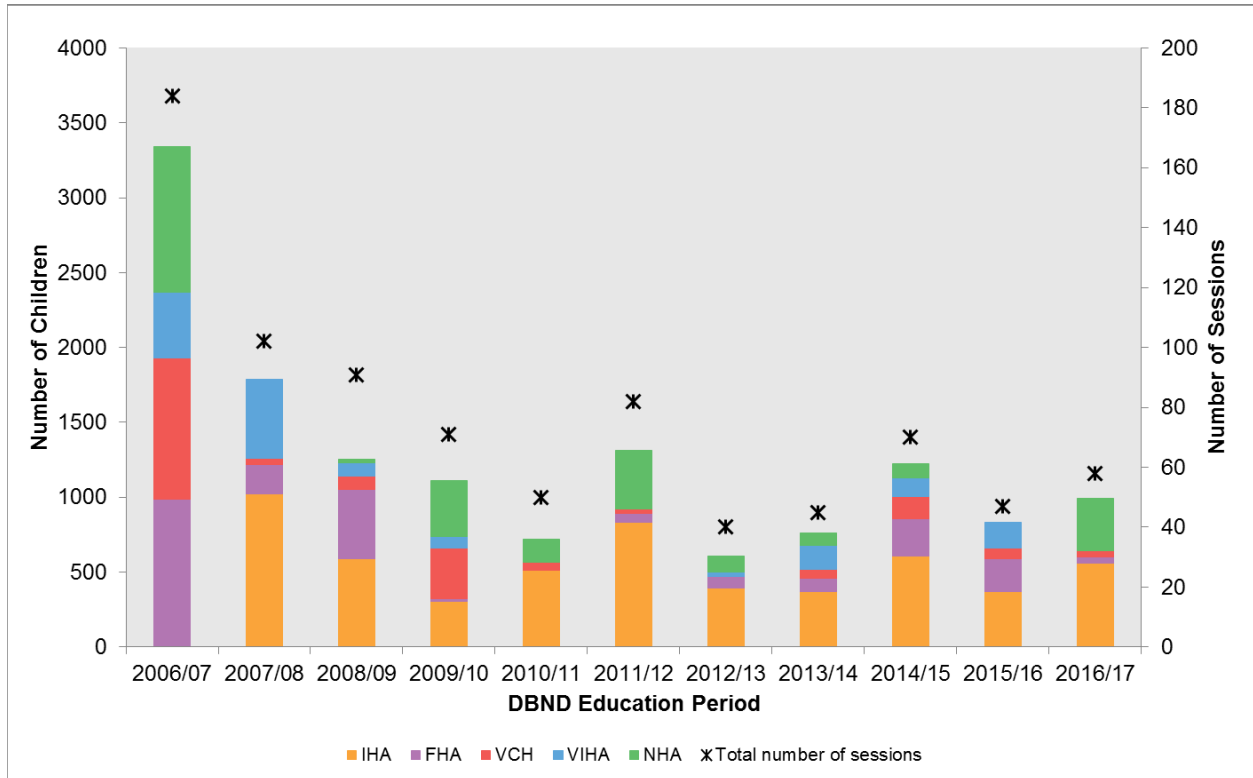
Public teaching within the DBND program is comprised of several components, including a Daycare Program, a Grade 2 Program, and an Older Adult Program. DBND also provides support for adaptation of the standard program under our General Teaching Program as well as for use of DBND-approved teacher resources for children in Kindergarten to Grade 3 (K-3). Public teaching programs are sustained by our community partners and are adaptable to available resources and needs. Educational resources for each of the DBND public teaching programs are publically available from the DBND website (<http://www.dobugsneeddrugs.org/>). The components of each public teaching program are described in more detail below.

In general, the number of public teaching sessions provided in the 2016/17 DBND education period remains consistent with recent years, with the exception of K-3 which has increased in activity. In addition, challenges remain regarding the voluntary completion of teaching documentation forms by healthcare professionals and students providing the sessions and submission of these forms to the DBND program in a timely fashion. These limitations likely result in an underestimation of number of sessions delivered.

### Daycare Program

The Daycare Program is taught to pre-school children aged two to five years and emphasizes the importance of teaching young children how proper hand washing can prevent the spread of disease and reduce the need for antibiotics. The program also introduces the concept of germs and illness through activities, songs, stickers, and parent-intended print material. The Daycare Program was launched in the fall of 2006; however, due to cutbacks to childcare resource personnel who initially led this initiative, implementation of this program component has been slower than anticipated. Collaborations with Early Childhood Education (ECE) programs have allowed the Daycare Program to remain active across the province. All of the health authorities have implemented the program to varying degrees.

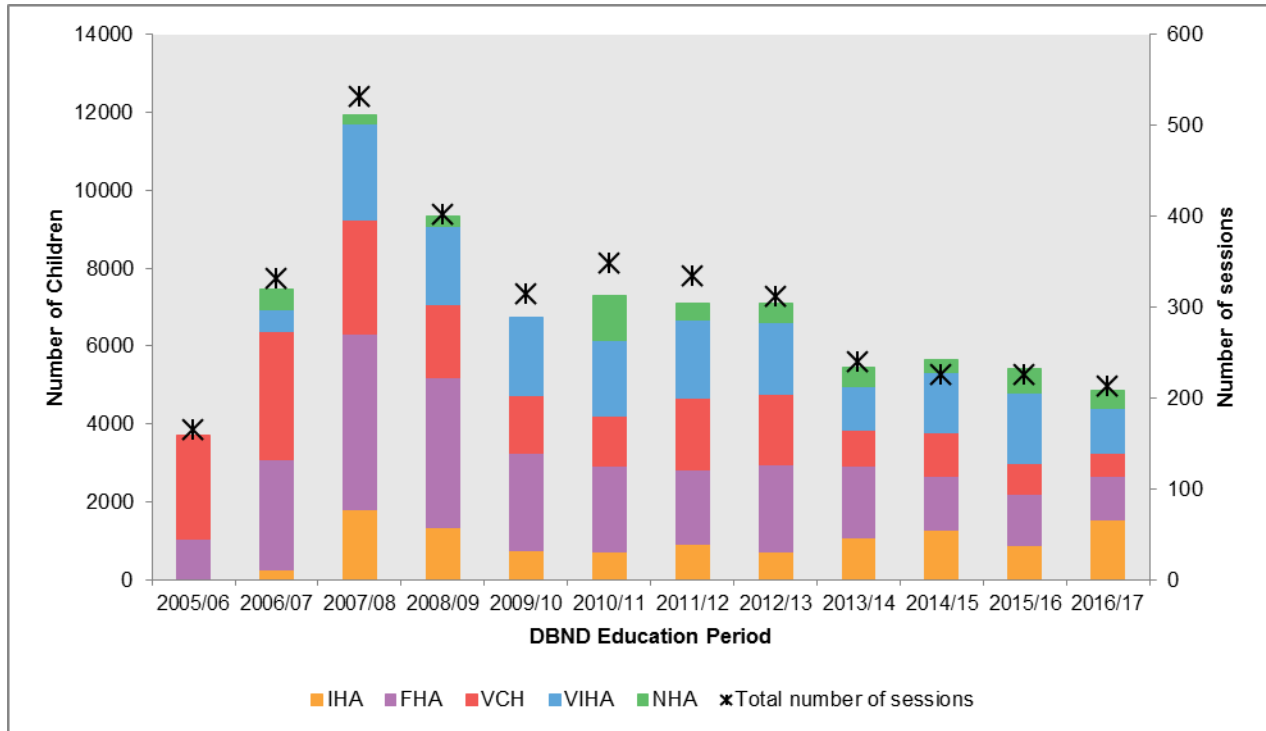
Since the implementation of the Daycare Program, a total of 841 sessions have been taught to 13,951 children across the province (**Figure 9**). During the 2016/17 DBND education period, 58 Daycare sessions were taught to 990 children across the province, including 561 (57%) children in IHA, 346 (35%) in NHA, 42 (4%) in FHA and 41 (4%) in VCH; VIHA did not report any sessions during the 2016/17 DBND education period.



**Figure 9.** Number of children taught under the Daycare Program by Health Authority and DBND education period, 2006/07 to 2016/17

## Grade 2 Program

The Grade 2 Program focuses on educating Grade 2 children, aged seven to eight years old, on the importance of frequent and proper hand washing, the dangers of misusing antibiotics, and the basic differences between viruses and bacteria. This program consists of various activities, songs, stickers, and parent-intended print material. This component of the DBND program was implemented in a staggered fashion throughout the province, with the first sessions taking place in VCH in September 2005. Since then, all five health authorities have implemented and maintained the Grade 2 Program to various degrees: FHA in the spring of 2006, NHA in the fall of 2006, VIHA in the winter of 2007 and IHA in the spring of 2007.



**Figure 10.** Number of children taught under the Grade 2 Program by Health Authority and DBND education period, 2005/06 to 2016/17

In total, 3,638 Grade 2 sessions have been taught to 82,141 children across the province to date. During the 2016/17 DBND education period, 212 Grade 2 sessions were taught to 4,847 children across the province (**Figure 10**). By Health Authority, the majority of children were taught in IHA (n=1,527; 32%), followed by VIHA (n=1,126; 33%) and FHA (n=1,126; 33%), VCH (n=609, 13%) and NHA (n=459, 9%). The majority of these sessions for 2016/17 were taught by nursing students (73%) and medical students (23%).(**Table 3**).

**Table 3.** Number of sessions taught under the Grade 2 Program by designation of person providing teaching and DBND education period, 2016/17

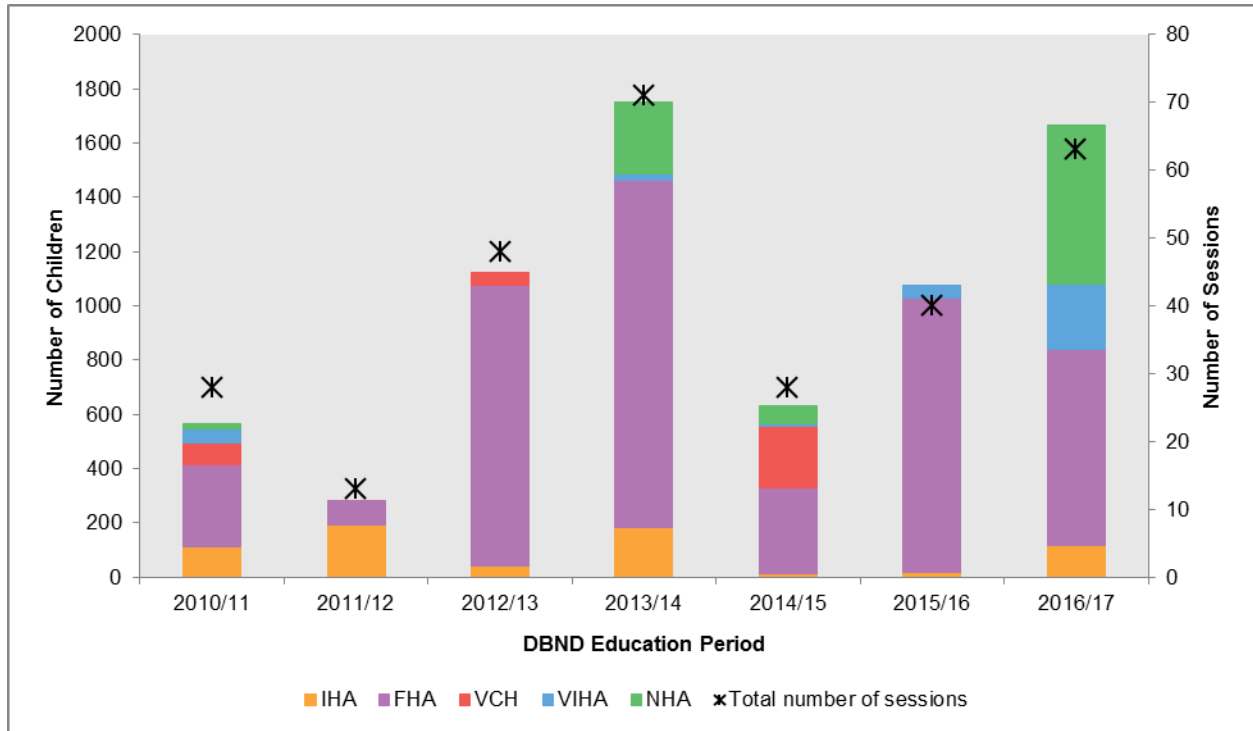
Designation of Person Providing Teaching	2016/17 DBND	All Years
	education period n (%)	n (%)
Nursing Student	154 (73)	2295 (63)
Medical Student	48 (23)	302 (8)
Pharmacist/Pharmacy Technician	8 (4)	683 (19)
Nurse	0 (0)	256 (7)
Teacher	0 (0)	43 (1)
Other*	2 (1)	58 (2)
<b>TOTAL</b>	<b>212 (100)</b>	<b>3637 (100)</b>

\*Other includes high school students, nursing instructors, physicians, healthcare assistants and early childhood educators

### Kindergarten to Grade 3 Teacher Resources

Teacher Resources for children in Kindergarten to Grade 3 (K-3) were originally developed by the DBND program in Alberta in collaboration with Alberta Health and Wellness and Alberta Education and were adapted to meet the BC education curriculum by an educational consultant. These resources allow BC elementary school teachers to teach curriculum-aligned and DBND-approved material to their students. The K-3 Teacher Resource component was implemented in BC starting in the 2010/11 DBND education period.

Since implementation of the K-3 Teacher Resource Program, a total of 291 sessions have been taught to 7,100 children across the province (**Figure 11**). During the 2016/17 DBND education period, 63 sessions were taught to 1,666 children, representing a 58% increase in sessions conducted and 55% increase in children taught overall compared to the previous 2015/16 DBND education period. Most sessions were held in FHA (n = 28, 44%) and NHA (n=22, 35%) followed by VIHA (n=7, 11%) and IHA (n=6, 10%).



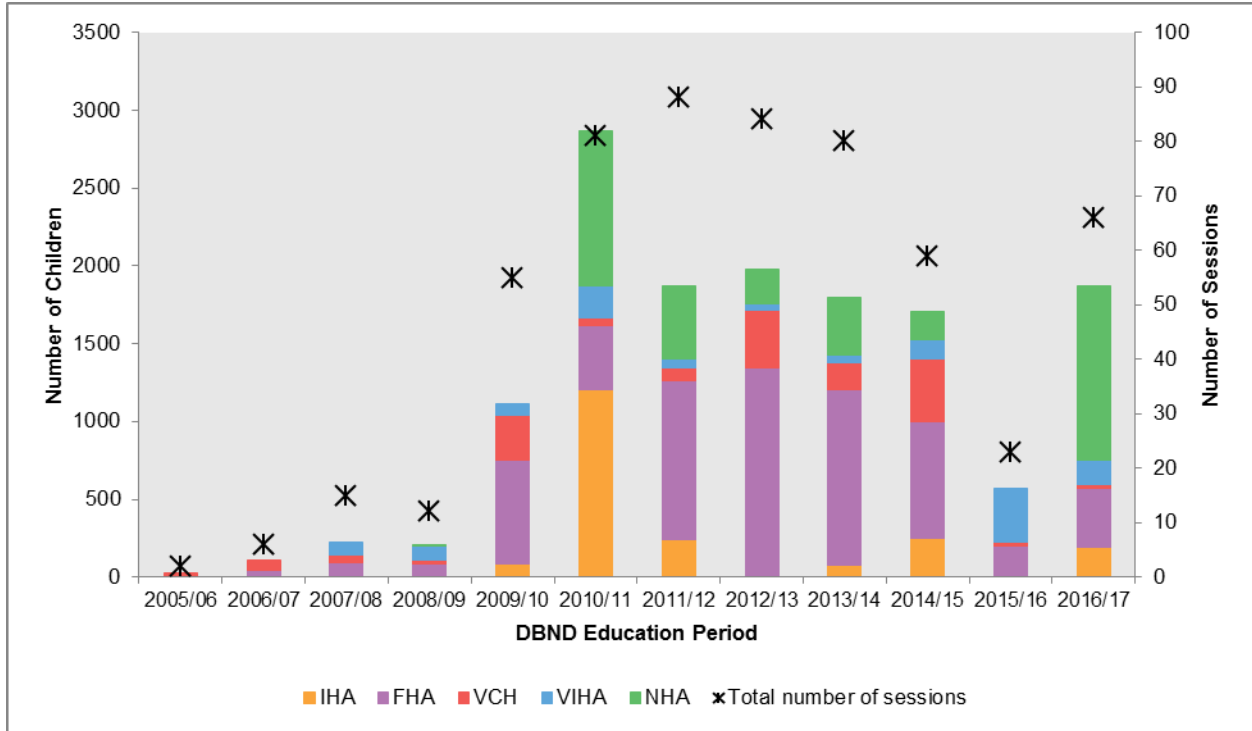
**Figure 11.** Number of children taught under the K-3 Teacher Resource Program by Health Authority and DBND education period, 2010/11 to 2016/17

## General Teaching

Additional DBND program teaching to school-aged children, as well as their parents and teachers, occurs under the General Teaching Program. These sessions represent elements of the formal education programs that are adapted to suit different age groups or abilities. The delivery of these sessions is at the discretion of the trainer to adapt the DBND program material as necessary and may not be consistent across sessions.

A total of 571 sessions have been taught to 14,359 children across the province under the General Teaching Program (**Figure 12**). The General Teaching Program was initiated during the 2009/10 DBND education period after becoming aware of instructors adapting the DBND Daycare, Grade 2, and Older Adult program components to meet the needs of other target audience groups, for example special needs children or high-school aged students. Since implementation, the General Teaching Program has remained an important component of the DBND public education program.





**Figure 12.** Number of children taught under the General Teaching Program by Health Authority and DBND education period, 2006/07 to 2016/17

During the 2016/17 DBND education period, 66 General Teaching sessions were taught to 1,871 children with the majority of children in NHA (60%), followed by FHA (20%), IHA (10%), VIHA (8%) and VCH (1.5%). Nursing students taught the majority of these sessions (94%) during the 2016/17 DBND education period (**Table 4**).

**Table 4.** Number of sessions taught under the General Teaching Program by designation of person providing teaching and DBND education period, 2016/17

Designation of Person Providing Teaching	2016/17 DBND education period*	All Years
	n (%)	n (%)
Nursing Student	62 (94)	482 (87)
Medical Student	0 (0)	3 (1)
Nurse	1 (2)	29 (5)
Pharmacist/Pharmacy Technician	0 (0)	10 (2)
Teacher	1 (2)	4 (1)
Other*	2 (3)	24 (4)
<b>TOTAL</b>	<b>66 (100)</b>	<b>552 (100)</b>

\*Other includes managers, directors, coordinators, pre-medical students, parents, nursing instructors, early childhood education students and health care assistants.

## Older Adult Program

The Older Adult Program, formerly called the Assisted Living Program, focuses on teaching older adults in care about the DBND three key messages. The delivery of this component is similar to the Grade 2 and Daycare programs in that personnel who are trained during train-the-trainer sessions deliver the DBND curriculum to assisted living staff, residents, and other individuals (e.g. family members). Data are presented by DBND education period (July to June) to align with the Grade 2 and Daycare reporting.

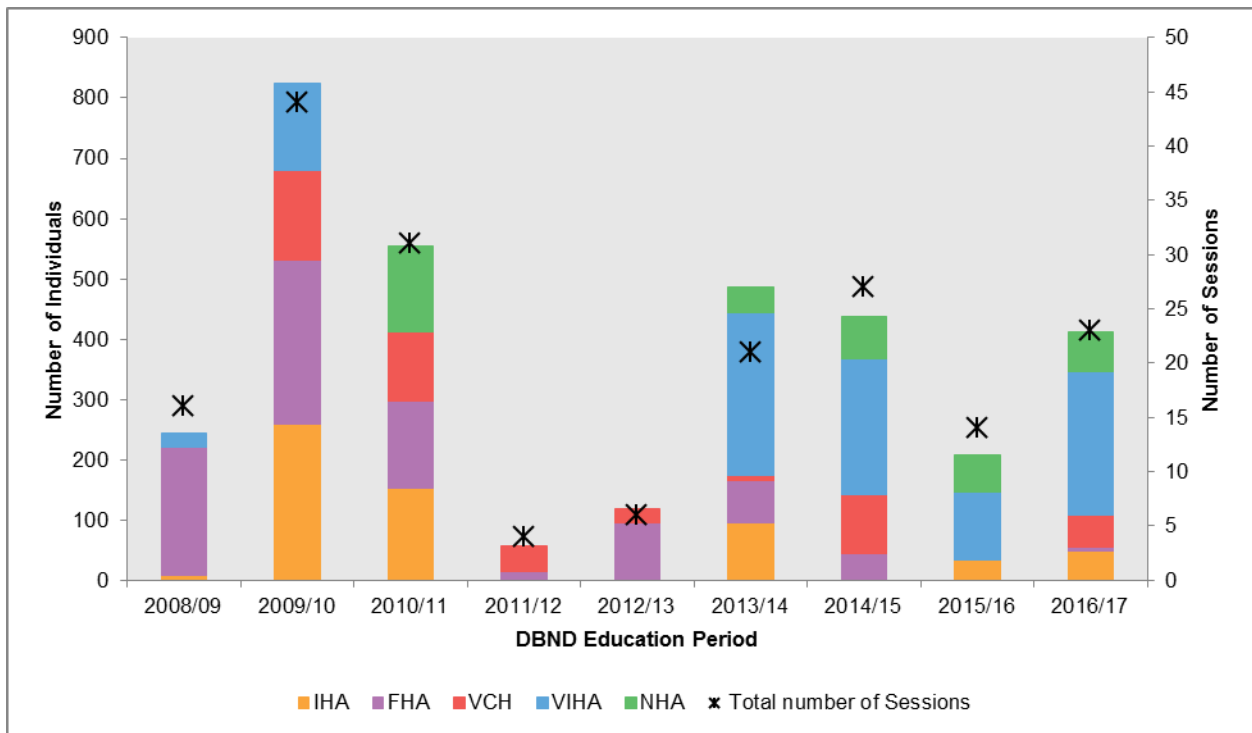
Since implementation of the Older Adult Program in 2008, a total of 186 sessions have been taught to 3,343 individuals across the province, including 634 staff, 2,437 residents, and 272 other individuals, (**Figure 13; Table 5**). Teaching numbers for the Older Adult program fluctuate from year-to-year based on the capacity of community partners to participate in program implementation.

**Table 5.** Number of individuals taught under the Older Adult Program by target audience and DBND education period, 2016/17 and overall

Target Audience	2016/17 DBND education period	All Years
	n (%)	n (%)
Staff	13 (3)	634 (19)
Residents	330 (80)	2437 (73)
Other*	68 (17)	272 (8)
<b>TOTAL</b>	<b>411 (100)</b>	<b>3343 (100)</b>

\*e.g. family members or visitors of residents

During the 2016/17 DBND education period, a total of 23 Older Adult sessions were conducted. Over half were held in VIHA (57%) followed by IHA (17%), NHA (17%), VIHA (4%) and VCH (4%). Audience members during these sessions included 13 staff (3%), 330 residents (80%), and 68 other individuals (17%)(**Figure 13**). The vast majority of sessions were taught by nursing students (91%) (**Table 6**).



**Figure 13.** Number of individuals (includes staff, residents, and other individuals) taught under the Older Adult Program by Health Authority and DBND education period, 2008/09 to 2016/17

**Table 6.** Number of sessions taught under the Older Adult Program by designation of person providing teaching and DBND education period, 2016/17

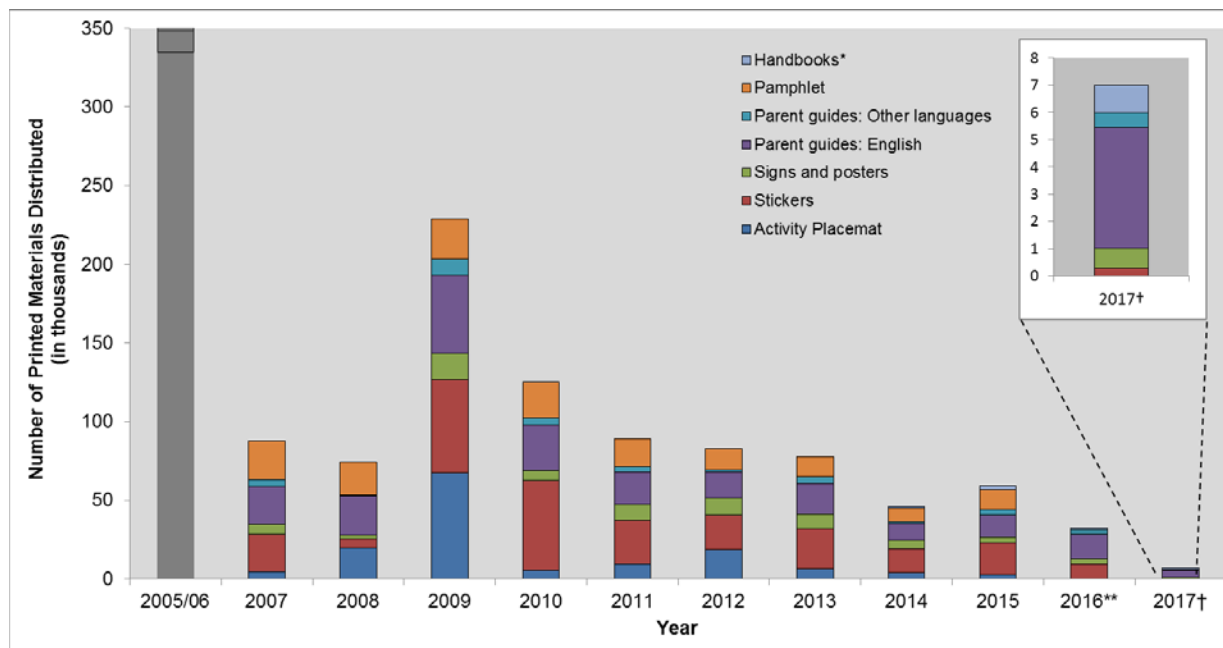
Designation of Person Providing Teaching	2016/17 DBND education period <sup>*</sup> n (%)	All Years, n (%)
Nursing Student	21 (91)	75 (40)
Nurse	1 (4)	52 (28)
Pharmacist/Pharmacy Technician/Pharmacy students	0 (0)	10 (5)
ECE or Health Care Assistant students	1 (4)	3 (2)
Teacher	0 (0)	7 (4)
Care aide/Healthcare assistants	0 (0)	7 (4)
Recreational Therapist	0 (0)	4 (2)
Director or manager	0 (0)	16 (9)
Site Leader	0 (0)	3 (2)
Other*	0 (0)	9 (5)
<b>TOTAL</b>	<b>23 (100)</b>	<b>186 (100)</b>

\*Other includes coordinators, support workers, advisors, or unknown

## Print Material Distribution

A variety of print material is available for distribution to the public (either in conjunction with educational sessions or upon request), through mass mail-outs, or through distribution to various health institutions. These materials are provided free-of-charge to BC residents.

Since implementation of the DBND program, 1.5 million print materials have been distributed across the province and elsewhere. The largest number of print materials was distributed in 2005/06, as the DBND program was fully implemented across the province (**Figure 14**). Since then, print material distribution numbers have decreased to more sustainable levels. By type of material, 156,551 activity placemats, 303,093 stickers, 93,930 signs and posters, 488,213 parent guides in English, 51,293 parent guides in other languages, and 394,284 pamphlets have been distributed since 2005/06. In recent years, the program has reduced the numbers of printed material available and has increased its digital presence as a more efficient means of distributing information.



**Figure 14.** Print material distribution by type of material and year, 2005/06 to 2017<sup>†</sup>

\*DVDs (not shown) as well as employer and worker handbooks were developed with Alberta and introduced as of 2014

\*\*At the end of the 2016 fiscal year (March 31, 2016), supplies of 6 ¾" x 17" poster with three key messages, the 3 ⅜" x 8 ½" pamphlet, and the 11" x 17" activity placemat had run out and were not re-ordered due to implementation changes

†Includes print material distribution up to June 30, 2017.

In 2016, over 32,000 print materials were distributed across the province: 9,522 stickers, 3,434 signs and posters, 15,684 parent guides in English, 2,574 parent guides in other languages (**Table 7**), and 91 pamphlets were distributed across the province. In addition, 888 employer and worker handbooks were distributed in 2016; over 5,000 handbooks have been distributed provincially since the 2014/15 fiscal year.

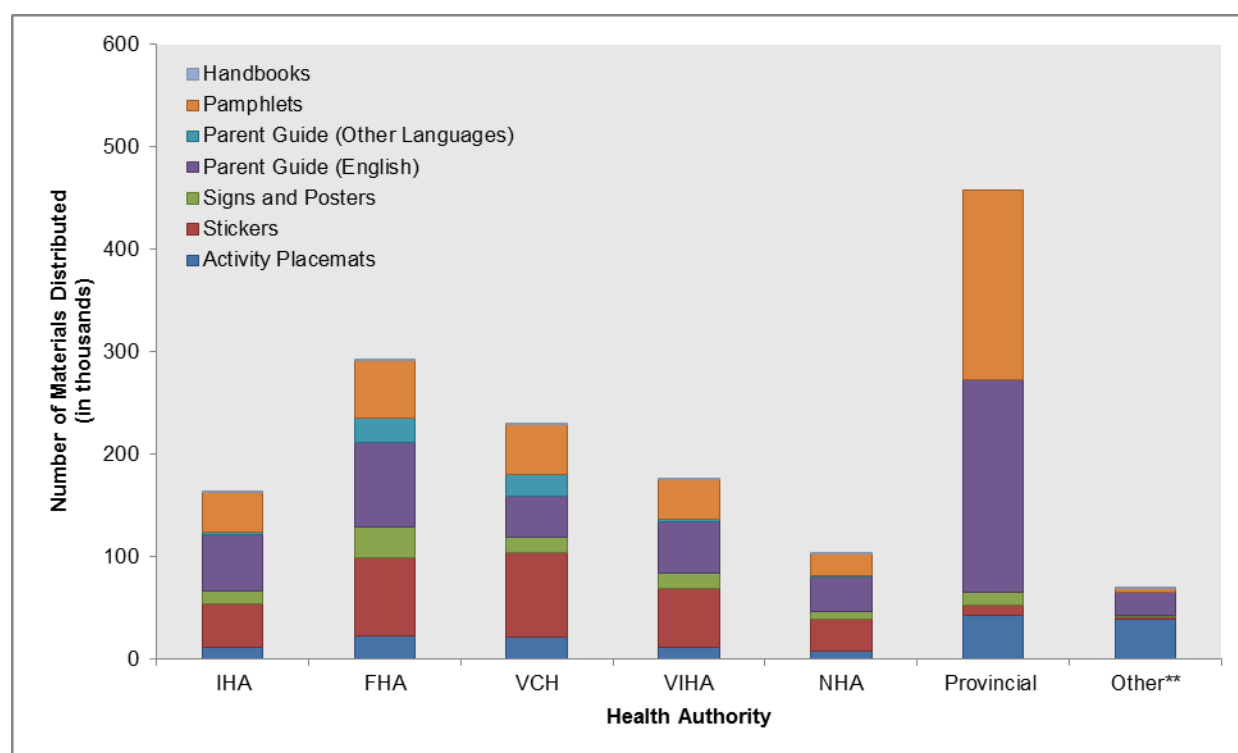
**Table 7.** Number of parent guides distributed by translated language in 2016 and overall

Language	2016 Year n (%)	All Years* n (%)
Punjabi	232 (9)	4192 (24)
French	308 (12)	3293 (19)
Chinese simplified	314 (12)	2134 (12)
Chinese traditional	192 (7)	1870 (11)
Persian	355 (14)	1598 (9)
Arabic	690 (27)	1342 (8)
Korean	333 (13)	1181 (7)
Vietnamese	28 (1)	770 (4)
Spanish	57 (2)	746 (4)
Somali	65 (3)	468 (3)
<b>TOTAL<sup>†</sup></b>	<b>2,574 (100)</b>	<b>17,594 (100)</b>

\*All years column includes data from 2011 to 2017 as of June 30, 2017

A decrease in material distribution can be noted compared to previous years which may be attributed to sites having adequate material from previous orders to sustain demand, in addition to discontinuing production of certain materials (pamphlets, activity placemats, and select posters) in the 2016/17 fiscal period after stocks were depleted by end of the previous period.

The majority of print materials have been distributed provincially either as part of the initial implementation of the DBND program (e.g., parent guides in English) or as part of ongoing children’s media initiatives (e.g., activity placements). By Health Authority, 20% of total print materials were distributed in FHA, 15% in VCH, 12% in VIHA, 12% in IHA, and 7% in NHA, with the remaining 36% distributed either provincially or to other national or international organizations (**Figure 15**).



**Figure 15.** Print material distribution by type of material and Health Authority since 2005/06\*

\* Includes print material distribution up to June 30, 2017.

† Other includes print material distribution to Providence, and to out-of-province, national, and international jurisdictions.

## Bugs and Drugs Antimicrobial/Infectious Diseases Reference Guide

The distribution of the *Bugs and Drugs* antimicrobial/infectious diseases reference guide continued this year, targeting physicians, medical residents and nurse practitioners<sup>13</sup>. The *Bugs and Drugs* reference was available as an iPhone or Android App. Only the iPhone App was provided as complimentary by the DBND program through funding from the Medical Beneficiary and Pharmaceutical Services Division of the

BC Ministry of Health. Although all complimentary apps have now been distributed, the iPhone App can be purchased through the iTunes store; and the Android App can be purchased through Google Play.

DBND worked with Alberta Health Services to make an online version of Bugs and Drugs ([www.bugsanddrugs.org](http://www.bugsanddrugs.org)) available to BC practitioners March, 27, 2017. Healthcare professional organizations and faculties and community partners notified and asked to make known to their members/colleagues.

Preliminary usage statistics became available for the Bugs and Drugs webpage beginning May 19<sup>th</sup> (**Table 8**). A total of 2007 sessions were reported as of June 18, 2017, with around half of users (52%) being new users. While sessions occurred in 50 BC cities over this one-month period, over 70% of sessions were among four cities: Vancouver (31%), Kelowna (21%), Victoria (10%) and Surrey (8%).

**Table 8.** Bugs & Drugs website usage statistics from May 19 to June 18, 2017.

Region/City	Sessions	% New Sessions	Average Pages per Session	Average Session Duration (Minutes)
<b>Overall</b>				
BC	2007	51.7	8.2	00:03:20
<b>Top 10 Cities</b>				
Vancouver	640	50%	7	00:03:20
Kelowna	419	51%	9	00:03:56
Victoria	206	64%	8	00:02:57
Surrey	161	65%	9	00:02:46
Richmond	109	61%	6	00:02:03
Prince George	104	52%	13	00:03:26
Burnaby	80	39%	8	00:02:59
Comox	46	11%	9	00:06:29
Kamloops	30	23%	14	00:10:09
Nanaimo	21	33%	6	00:03:45

# Program Outcome Evaluation



## Trends in Antimicrobial Utilization

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Trends in antimicrobial utilization in BC are monitored to:

1. Evaluate population-level antimicrobial utilization trends in BC; and
2. To assess changes in prescribing patterns by indication in BC.

These surveillance activities allow for the evaluation of the potential impact of the DBND program implementation on overall, class-specific, and indication-specific antimicrobial utilization in BC. Data for these surveillance activities are obtained from the PharmaNet database of outpatient prescriptions dispensed from community-based pharmacies in BC and the Medical Services Plan (MSP) payment files which contain claim records for all medically billable services provided by healthcare practitioners and remunerated under fee-for-service schedule to individuals covered under the provincial insurance plan. Data is currently available up to 2014; a data refresh is currently underway and data from 2015 and 2016 will be available to DBND for analysis in the 2017/18 fiscal period.

In previous years, a comprehensive summary of antimicrobial utilization trends in the province of BC was compiled in an annual report entitled “British Columbia Annual Summary of Antibiotics Utilization.” These reports were replaced in 2016 by a web-embedded interactive data visualization platform (or “dashboard”) that allows users to examine and manipulate BC’s utilization data in an intuitive point-and-click format: the BCCDC Antimicrobial Utilization Dashboard (**Figure 16**).

Available on the BCCDC website under “Antimicrobial Surveillance Tools” (<http://www.bccdc.ca/health-professionals/data-reports/antimicrobial-surveillance-tools>), the Antimicrobial Utilization Dashboard allows users to view trends and distributions in the MSP-linked PharmaNet data across several parameters such as specific antibiotic, indication, prescriber type or health region for all years of data currently available (1996 to 2014) (**Figure 16a**). This dashboard is also accompanied by an Executive Summary that highlights overall trends of interest (**Figure 16b**).

This reporting resource will improve exploration and access to information, facilitate more rapid data updates annually, in addition to being conducive to further innovation and modification (adding geographical visualization of data or additional analysis parameters, for example).

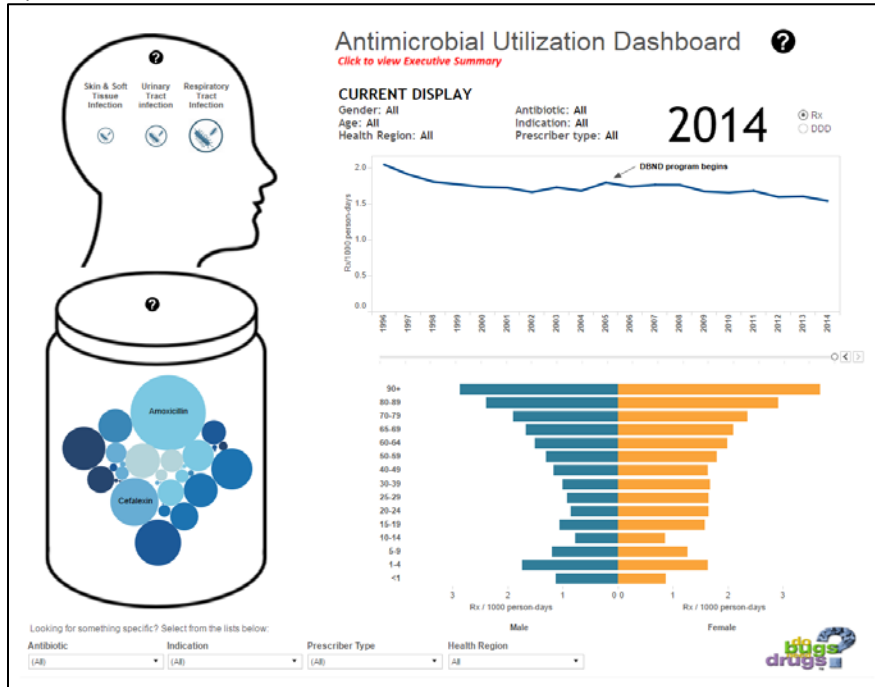
With the addition of 2014 data, utilization trends have generally remained consistent, including:

- Overall antibiotic utilization continued to decline in 2014 to 16.1 DDD/1000 population/day, representing an decrease of 9% compared to 2005
- Penicillins continue to be the most-utilized antibiotic, however tetracyclines have become the second most utilized in 2014, displacing macrolides in 2013
- Overall consumption rates for macrolides, quinolones and sulfonamide/trimethoprim classes continue to decline, whereas the J01X class of “other antibacterials”, driven primarily by nitrofurantoin use, appears to be stabilizing after an increasing trend from 1996 to 2012
- Prescription rates for all age groups were lower in 2013 relative to 2005 with the exception of the 80-89 age group. Data from 2014 suggests that while this continues to hold true, prescriptions among the 80-89 age group may be on the decline.
- In 2014, regional prescription rates ranged from a low of 1.19 prescriptions/1000 population/day in Richmond, to a high of 1.81 prescriptions/1000 population/day in Fraser East
- MSP-linked data shows that prescribing for skin and soft tissue infections and respiratory tract infections have been steadily declining. As previously reported, prescription rates associated with

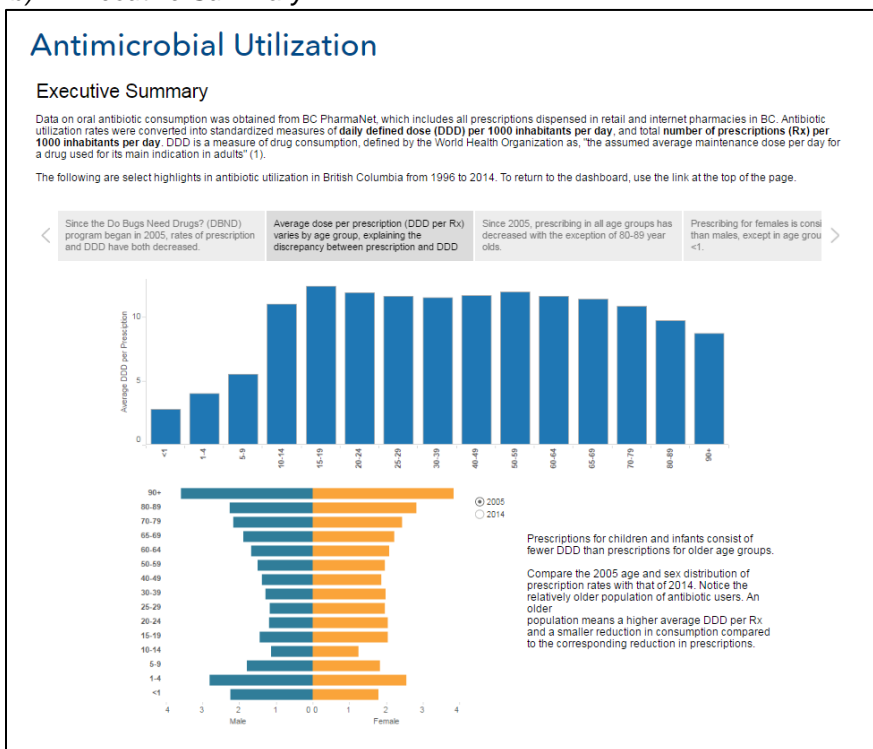
urinary tract infection (UTI) have been increasing since 2005. However, data in 2014 suggests rates may be declining, with a 5% decrease in prescriptions/1000 population/day associated with UTI relative to the previous year.

**Figure 16.** The BCCDC Antimicrobial Utilization Dashboard.

a) *Dashboard User Interface*



b) Executive Summary

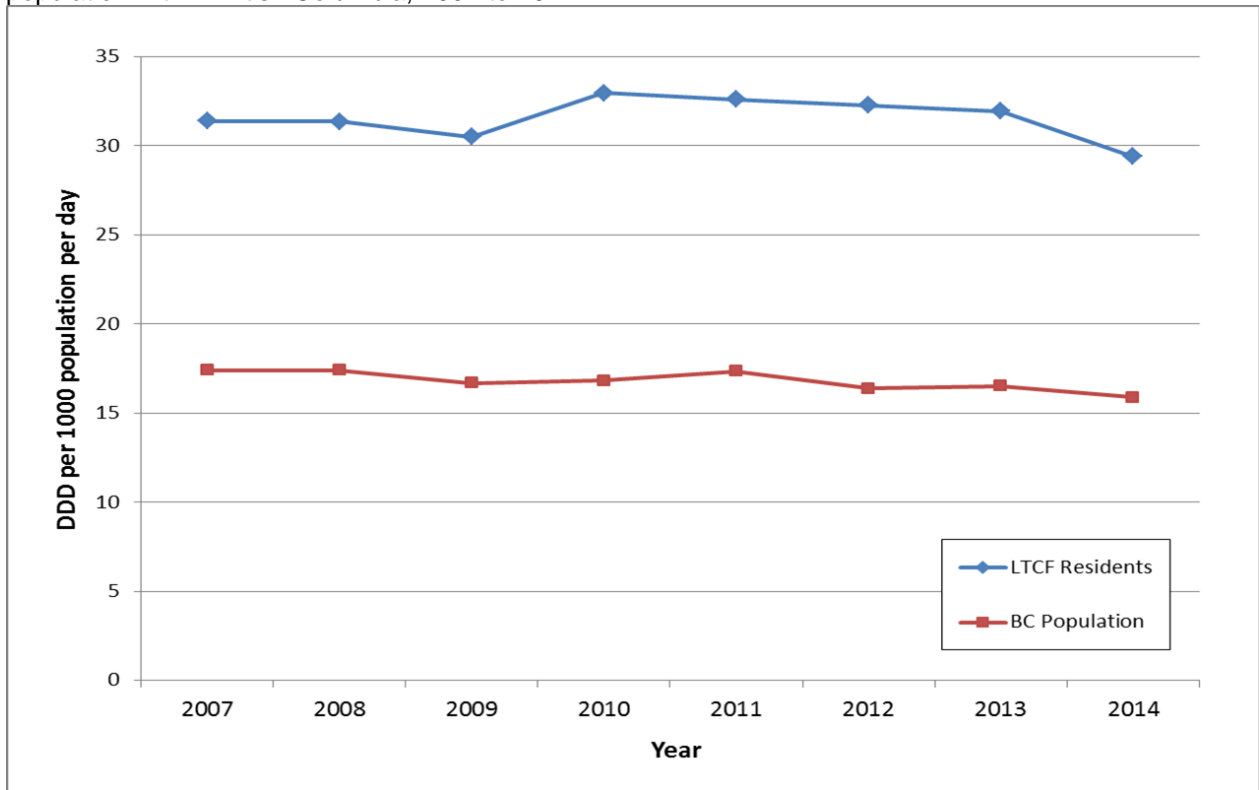


Indication-specific analyses are currently underway, including examination of whether delayed prescription-filling practices have been adopted successfully in recent years with respect to otitis media, and investigation into declining rates of antibiotic use for prostatitis. DBND is also supporting evaluation of the Provincial Academic Detailing (PAD) intervention to reduce unnecessary antibiotic use associated with asymptomatic bacteriuria in BC's long term care facilities, which will utilize indication-linked data for statistical modelling.

This year, DBND examined prescribing and utilization trends in long-term care facilities (LTCF) using the "Plan B" prescription flag available in PharmaNet. "Plan B" is a pharmaceutical coverage plan specific to LTCF residents, allowing the identification of prescriptions associated with an LTCF resident. Overall utilization in BC's LTCF is nearly double that of BC's overall population at around 30 DDD/1000 residents/day (**Figure 17**). Where respiratory tract infections are the indication most associated with prescriptions in the general population, among LTCF residents, urinary tract infections are the most commonly associated, with an overall utilization rate 22% higher than respiratory tract infections in 2014 (data not shown). These findings provide a baseline for antibiotic use in BC's LTCF, as well as reinforce the necessity of the activities led by PAD, AMMI, and DBND that aim to reduce inappropriate prescribing among LTCF residents. The findings of this study have been submitted for publication.

From February to April 2017, Dr. Patrick visited a number of Australian health centres to exchange knowledge and experience with leaders in antimicrobial stewardship initiatives. The information obtained from these exchanges will also be helpful in informing future direction and activities of the program.

**Figure 17.** Overall antibiotic utilization in long-term care facilities compared to utilization in the general population within British Columbia, 2007 to 2014



## Trends in Antimicrobial Resistance

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Trends in antimicrobial resistance in BC are monitored to:

1. Provide a comprehensive overview of antimicrobial resistance trends in BC; and
2. Correlate these trends with trends in antimicrobial utilization in BC.

These surveillance activities allow for the evaluation of the potential impact of the DBND program implementation on changes in antimicrobial resistance rates among relevant pathogens and for particular drug classes of interest. Data on antimicrobial resistance rates are compiled each year from a variety of regional, provincial and national sources. As of June 30, 2017, data from both BC Biomedical Services (BC Biomed) and LifeLabs Medical Laboratory Services (LifeLabs) from 2007/2008 to 2015 has been obtained and analysed, with 2016 data arriving in July 2017. In addition, a single consolidated dataset will be provided beginning in 2017 as a result of the purchase of BC Biomed and the standardization of testing protocols across the two laboratory services. LifeLabs now accounts for 90% of all community laboratories in BC.

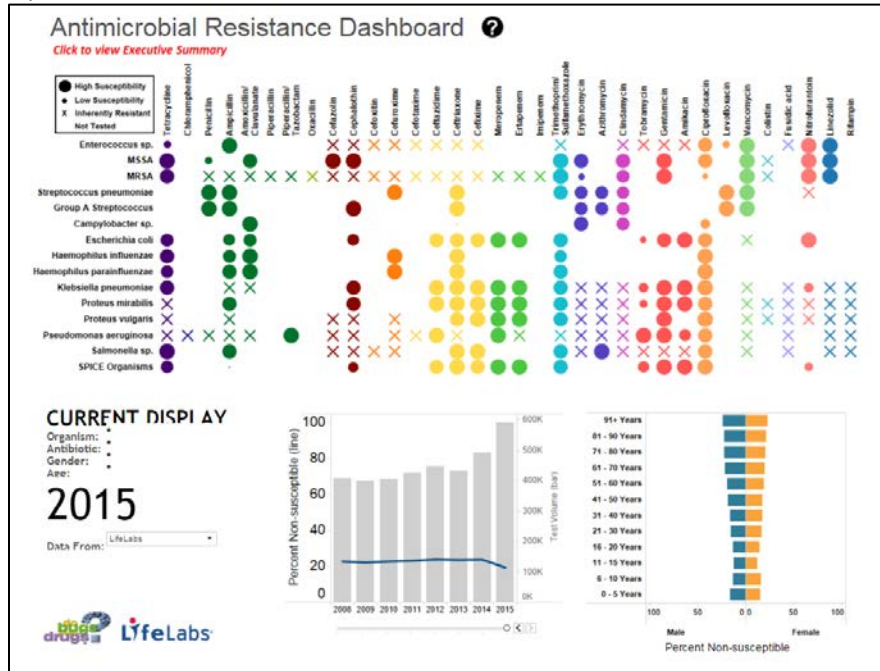
As with the annual utilization report, a comprehensive summary of antimicrobial resistance trends observed in this data was formerly compiled in a report entitled “Antimicrobial Resistance Trends in the Province of British Columbia.” In 2016, this has also been replaced with a dashboard that utilizes LifeLabs data and is posted on the BCCDC website under “Antimicrobial Surveillance Tools” (<http://www.bccdc.ca/health-professionals/data-reports/antimicrobial-surveillance-tools>) (Figure 18). The Antimicrobial Resistance dashboard is designed to emulate an antibiogram, and again displays trends over time as well as distributions across parameters such as population characteristics (Figure 18a).

An accompanying Executive Summary is also available (Figure 18b). Highlights of the 2015 Lifelabs/BC Biomedical data update include:

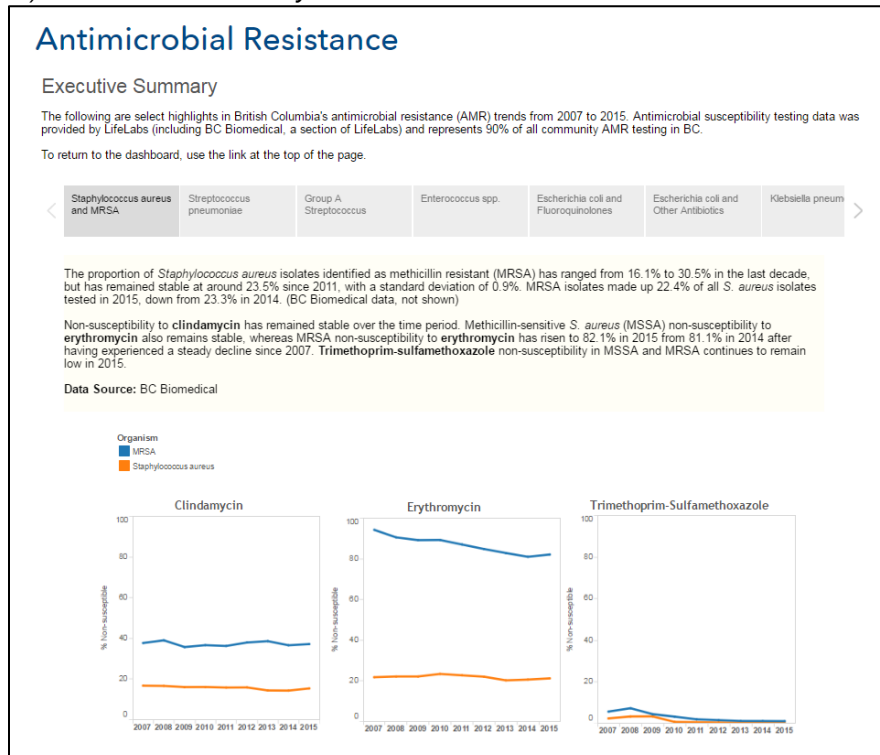
- BC Biomedical data shows that non-susceptibility of methicillin-resistant *Staphylococcus aureus* (MRSA) to erythromycin remains high in 2015 with over 80% of isolates demonstrating non-susceptibility, as with clindamycin at 37%, whereas trimethoprim-sulfamethoxazole non-susceptibility in both MRSA and methicillin-sensitive *Staphylococcus aureus* (MSSA) continues to remain low (< 2 %) in 2015.
- In keeping with previous trends, a quarter of Lifelabs’ *E. coli* isolates (24.9%) demonstrated non-susceptibility to ciprofloxacin in 2015, while *E. coli* non-susceptibility to nitrofurantoin remains low with 2.4% of BC Biomedical isolates demonstrating non-susceptibility. Non-susceptibility of *E. coli* to ampicillin has dropped by 7% in 2015 to 42.5% of isolates after a period of increasing non-susceptibility from 2009 - 2014.
- In 2015, BC Biomedical data demonstrates that Group A Streptococcus (GAS) continues to be fully susceptible to penicillin (0% of isolates), and non-susceptible to trimethoprim/sulfamethoxazole and ciprofloxacin (99.8% and 100%, respectively). Lifelabs data indicate that in 2015, GAS non-susceptibility to the macrolides erythromycin and clindamycin have exceeded previous peak levels, with 27.9% and 26.3% non-susceptible to these antibiotics, respectively.
- Data from both Lifelabs and BC Biomedical suggests that non-susceptibility of *Haemophilus influenzae* to ampicillin may be on the rise in recent years, and in 2015, 30.4% of Lifelabs’ isolates were non-susceptible. This is a 22% increase from the previous year, and the highest level of non-susceptibility in the 2008-2015 period.

Figure 18. The BCCDC Antimicrobial Resistance Dashboard.

a) Dashboard User Interface



b) Executive Summary



With the introduction of the *Federal initiative: Antimicrobial Resistance and Use in Canada: A Federal Framework for Action* announced in November 2014, the gap in community surveillance of antimicrobial resistance was highlighted and addressed. The Canadian Antimicrobial Resistance Surveillance System (CARSS) was established in an effort to integrate the multiple systems collecting data on resistance in Canada as well as expand the system to include more sources of community data. DBND and BC community laboratory members were actively engaged in the discussions with regards to the current surveillance system in BC and how other provinces may be able to use a similar framework. In the fall of 2016, CARSS released a report that provides a detailed analysis of surveillance data up to 2014, summarizing antimicrobial resistance and utilization in Canada among humans and animals, as well as further elaborating on information gaps and limitations to what is currently available. The report can be viewed on the Government of Canada website (<https://www.canada.ca/en/public-health/services/publications/drugs-health-products/canadian-antimicrobial-resistance-surveillance-system-report-2016.html>)

## Progress Update: Logic Model Impacts

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The impacts defined in a program's logic model are measurable indicators of change that represent the intended outcomes of a program's activities, and are an essential component of a program's outcome evaluation. In the current Do Bugs Need Drugs? Program logic model (**Figure 2** on page 4), five impacts are listed:

1. Stabilization of or decrease in antimicrobial resistance in BC
2. Reduction in overall use of antibiotics by 1 DDD per 1000 inhabitant days in BC
3. Reduction in use of newer macrolides and fluoroquinolones by 20% in BC
4. Reduction in prescriptions for bronchitis and otitis media by 15% in BC
5. Reduction in morbidity associated with antibiotic resistant infections

Review of available data in the context of these impacts reveals that several of these impacts have been achieved, and are summarized in **Table 9**.

Despite the fact that direct causation for these outcomes cannot be attributed to the DBND program due to the ecological nature of the analyses possible using available data, these achievements serve to reinforce the value of the program's activities and initiatives that aim to support positive modification of prescribing behaviour and trends. While the magnitudes of change observed here are encouraging, much work remains to be done if we are to achieve the levels of reduction in inappropriate antibiotic use observed by international leaders like the Netherlands, who report 20 to 25% lower levels of prescribing compared with BC.

In addition, achievement of these impacts suggests that a thorough review of the logic model is warranted to establish revised and more ambitious impacts that are achievable and measurable in the context of BC's recent progress. Discussion is currently underway and a revised logic model is anticipated for the 2017/2018 year.



**Table 9.** Summary of Logic Model Impact Goals Achieved

<b>Impact Measure</b>	<b>Achieved in</b>	<b>Description</b>
<i>Reduction in overall use of antibiotics by 1 DDD per 1000 inhabitant days in BC</i>	2012	Compared with the overall level of antibiotic use in 2005, a reduction of 1.2 DDD per 1000 inhabitant days was first observed in 2012. Reduction in use has remained 1 DDD per 1000 inhabitant days or greater relative in subsequent years (most recently, a total reduction of 1.64 DDD per 1000 inhabitant days in 2014 relative to 2005).
<i>Reduction in use of newer macrolides by 20% in BC</i>	2009	Examination of percent reduction in macrolide use relative to 2005 rates showed that prescription rates (prescriptions per 1000 inhabitant days) had declined by 20% as of 2009, and utilization rates (DDD per 1000 inhabitant days) as of 2012. Both prescription and utilization measures have continued to decline since, with a reduction of 41% and 33% observed in 2014, respectively.
<i>Reduction in use of fluoroquinolones by 20% in BC</i>	2014	In 2014, fluoroquinolone use relative to 2005 levels surpassed the 20% reduction mark, with both fluoroquinolone prescription rates (prescriptions per 1000 inhabitant days) and utilization rates (DDD per 1000 inhabitant days) experiencing a 21% reduction that year.
<i>Reduction in prescriptions for bronchitis by 15% in BC</i>	2009	A 15% reduction in prescription rates for bronchitis (prescriptions per 1000 inhabitant days) was surpassed in 2009, which saw a 22% reduction that year compared to 2005. Rates have continued to decline since, with a reduction of 36% observed in 2014.
<i>Reduction in prescriptions for otitis media by 15% in BC</i>	2008	A 15% reduction in prescription rates for otitis media (prescriptions per 1000 inhabitant days) relative to 2005 was first observed in 2008. Rates have continued to decline since, with a reduction of 38% observed in 2014.

## Conclusions

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As Canada continues to address antibiotic resistance, stewardship advocates in other Canadian jurisdictions reference the strong example of stewardship efforts delivered through the *Do Bugs Need Drugs?* program as guidance for the rest of the country.

After twelve years of delivering the DBND program in BC, program components have been implemented to various degrees within all of the health authorities in BC and continue to expand. A large number of children and adults, including health care professionals, continue to receive DBND teaching. Development of new material continues for different target populations and distribution of all materials has been extensive. Alternative approaches of reaching target audiences with the three key messages are being implemented. An increased social media presence allows the program to disseminate key messaging to a wider audience. Social media has the unique ability to facilitate direct engagement with the audience and moves away from the exclusive use of push messaging employed by traditional media such as television, radio, and print. Social media provides the DBND program with the opportunity to not only educate the public but to enlist the audience in spreading the message.

The ongoing collaboration with the PAD pharmacists enables the DBND program to expand the reach of educational initiatives to healthcare professionals in BC.

DBND, in its twelfth year of implementation, is showing positive achievements in addressing antibiotic resistance. The continued collaboration with community providers of laboratory testing services in BC has allowed for better geographical representation of resistance data. These data will enhance provincial estimates and better inform practices and recommendations.

The increased levels of antibiotic use being observed among dental surgeons highlight the importance of engaging all prescribing professions when attempting to control antibiotic use in the province. The results of the national survey of dentists will be instrumental in guiding future educational initiatives directed at this profession.

The increased use of antibiotics to treat UTIs, particularly among BC residents aged 60 or older, has stimulated targeted educational interventions and studies to address the issue. Future utilization trends will be instrumental in assessing the effectiveness of these interventions and their impact on health outcomes for this population.

The indicators reflected in this report will continue to inform program planning. With continued program growth and concerted effort, further strides can be made to improve appropriate utilization of antibiotics, stabilize trends in antibiotic resistance, and ultimately minimizing negative health outcomes.

## Contributions and Acknowledgements

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### Team Members

**Edith Blondel-Hill**, MD, Medical Director, DBND Program, and Medical Director, Antimicrobial Stewardship Program, Interior Health Authority, and Microbiologist/Infectious Diseases Specialist, Interior Health Authority

**Kim Dreher**, RN, BScN, Program Coordinator, DBND Program, BC Centre for Disease Control

**Fawziah Lalji**, PharmD, Professor, Faculty of Pharmaceutical Services, University of British Columbia

**Mark McCabe**, MPH, Epidemiologist, DBND Program, BC Centre for Disease Control

**Laura Moore**, Administrative Assistant, DBND Program, BC Centre for Disease Control

**David Patrick**, MD, MHSc, Medical Epidemiology Lead for Antimicrobial Resistance, BC Centre for Disease Control, and Professor, School of Population and Public Health, University of British Columbia

**Dale Purych**, MD, Medical Microbiologist, BC Biomedical Laboratories, and Clinical Assistant Professor, Pathology and Laboratory Medicine, Faculty of Medicine, University of British Columbia

**Romina Reyes**, MD, FRCPC, MSc, Medical Microbiologist, LifeLabs

**Stuart Shepherd** Social Media Analyst, DBND Program, BC Centre for Disease Control

**Bin Zhao**, MSc, Biostatistician, Public Health Analytics, BC Centre for Disease Control

### Contributors to Report

Mark McCabe, Kim Dreher, Latitude/Mediacom, Stuart Shepherd, David Patrick, Edith Blondel-Hill

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The authors would also like to thank the following community partners and champions for the program: British Columbia's health authorities; nursing students, early childhood education students, , medical students and faculty from various colleges/universities (see list below); pharmacists/pharmacy technicians from various Overwaitea Food Group stores; the BC PAD pharmacists; child care resource and referral centre staff; childcare providers; healthcare workers caring for older adults; Lamar Transit Advertising; Latitude Agency; MediaCom; the DBND Stakeholder Advisory Committee members including Mr. Walton Pang, Mr. Patrick Crawford and Ms. Shirley Yeung for being strong advocates of the program and the British Columbia Ministry of Health, Medical Beneficiary & Pharmaceutical Services Division. Finally, we would like to thank Dr. Perry Kendall, Provincial Health Officer for BC, who has championed the program over the past twelve years.

Antimicrobial data were provided by LifeLabs Medical Laboratory Services and BC Biomedical Laboratories to the DBND program for the purposes of assessing changes in trends over time.

PharmaNet data were provided as part of a data sharing agreement between the BC Centre for Disease Control and the BC Ministry of Health for the purposes of evaluating the DBND program.

Colleges and Universities participating in the program:

- Camosun College (Victoria)
- College of the Rockies (Cranbrook)
- North Island College (Courtenay)
- Okanagan College (Kelowna)
- Selkirk College (Castlegar)
- Trinity Western University (Langley)
- Thompson Rivers University (Williams Lake)
- Vancouver Island University (Nanaimo)
- UBC (Vancouver)
- UBC Okanagan (Kelowna)
- UNBC (Prince George & Terrace)
- University of the Fraser Valley (Chilliwack)
- University of Victoria
- College of New Caledonia (Prince George)
- Sprott Shaw Community College

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- <sup>6</sup> Ranji SR, Steinman MA, Shojania KG, Gonzales R. Interventions to reduce unnecessary antibiotic prescribing: a systematic review and quantitative analysis. *Med Care* 2008; 46(8):847-862.
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- <sup>8</sup> Mamdani M, McNeely D, Evans G, et al. Impact of a fluoroquinolone restriction policy in an elderly population. *Am J Med* 2007; 120(10):893-900.
- <sup>9</sup> Marra F, Patrick DM, White R, Ng H, Bowie WR, Hutchinson JM. Effect of formulary policy decisions on antimicrobial drug utilization in British Columbia. *J Antimicrob Chemother* 2005; 55(1):95-101.
- <sup>10</sup> Lamar Advertising. Email Communication, January 25, 2017.
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- <sup>12</sup> Google Analytics Report. Accessed, June 22, 2017.
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# Appendix

# Transit Advertisements


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Example 1. Advertisement on Side of Bus (King)




# Digital Display Advertisements (Audience Targeting and Facebook Newsfeed)

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 **Do Bugs Need Drugs?**  
January 13 · 🌐

Talk to your doctor next time you're prescribed antibiotics.



Antibiotics  
don't work  
against cold or  
flu viruses.

antibiotic  
*WISE*.ca

**Be Antibiotic Wise**  
Do you really need antibiotics?  
ANTIBIOTICWISE.CA [Learn More](#)

142 Likes 19 Comments 49 Shares

➔ Share





### Do Bugs Need Drugs?

January 13 · 🌐

Antibiotics don't work against cold or flu viruses. Learn more at [antibioticwise.ca](http://antibioticwise.ca)



### Be Antibiotic Wise

Tips for proper antibiotic use.

[ANTIBIOTICWISE.CA](http://ANTIBIOTICWISE.CA)

[Learn More](#)

161 Likes 27 Comments 61 Shares

[Share](#)

The screenshot shows the homepage of the antibioticwise.ca microsite. At the top left is the logo "antibiotic wise.ca". To the right is a search bar and a "CONTACT" link with social media icons for Facebook, Twitter, and YouTube. Below the logo is a navigation menu with links for "ABOUT ANTIBIOTICS", "ANTIBIOTIC RESISTANCE", "PREVENTION", "RESOURCES", and "ABOUT US".

The main content area features several sections:

- A large hero section with a background image of a woman blowing her nose. A pink box on the left contains the text: "Antibiotics don't work against cold or flu viruses. Be antibiotic wise." Below this is a "READ MORE" button.
- Two smaller article teasers: "What you need to know about Antibiotics" (with a "READ MORE" button) and "What are superbugs?" (with a "READ MORE" button").
- A section titled "Do I need antibiotics for:" with a dropdown menu labeled "MAKE A SELECTION" and a "CONTINUE >" button. The background image shows a man and a woman looking at a document.
- A section titled "ANTIBIOTIC RESISTANCE • A GLOBAL ISSUE" with a "READ MORE" button. It features three circular infographics:
  - A blue circle: "22.8M antibiotic PRESCRIPTIONS were dispensed by CANADIAN pharmacies in 2013." (Source: Public Health Agency of Canada)
  - A pink circle: "Over the last 30 years, NO major types of ANTIBIOTICS have been DEVELOPED." (Source: World Health Organization, 2014)
  - An orange circle: "At least 23,000 people DIE EACH YEAR from antibiotic resistant infections." (Source: Get SMART Campaign)
- Three buttons at the bottom: "RESOURCES FOR PROFESSIONALS", "TAKE THE ANTIBIOTIC QUIZ!", and "SEE OUR VIDEOS".

At the bottom, it says "WITH SUPPORT FROM" and lists three logos: "BRITISH COLUMBIA", "BC Centre for Disease Control", and "bugs drugs".

## Technical Notes

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### Data Sources

#### Media Campaign

Target audience numbers and viewing times for the television advertisement were obtained from a Television Post Buy Summary prepared for the DBND Program by Latitude Agency. The figures are based on Numeris audience data, formerly Broadcast Bureau of Measurement (BBM) audience data.

Transit ridership numbers were provided by Lamar Advertising. For buses, estimates are calculated for people entering and exiting the busby municipality.

#### Education Program

Health care professional education sessions are tracked internally following delivery of any DBND education activities that are directed toward health care professionals (including physicians, pharmacists, nurses, and infection control practitioners) or other individuals (including other care providers, educators, students, and the public). Teaching numbers and target audience groups are estimated based on expected audience attendance and composition. Health care professional education also encompasses train-the-trainer sessions offered to health care professionals and students who then deliver the DBND program under the public teaching components.

Public teaching numbers are submitted by health care professionals and students who deliver DBND program components under the Daycare, Grade 2, General Teaching, Older Adult, or K-3 Teacher Resource programs. Documentation forms are submitted to the DBND program on a voluntary basis. Accordingly, the public teaching numbers presented in this report likely underestimate true program reach, as compliance is likely less than 100%.

#### Print Material Distribution

Print material distribution numbers are tracked internally following shipment of DBND program materials to various health institutions (e.g., health clinics, health units, hospitals) or through distribution of materials in conjunction with implementation of program components. Print materials can be requested free of charge by BC residents through the DBND website.

#### Antimicrobial Utilization Data

Antimicrobial utilization data were obtained from the BC PharmaNet database of outpatient prescriptions for oral antimicrobials for systemic use for years 1996 to 2014. The PharmaNet database includes records of all outpatient prescriptions dispensed from community pharmacies in BC. It excludes over-the-counter medications, medications administered to inpatients in acute care hospitals, medication samples dispensed at a physician's office, and medications administered for veterinary or agricultural use. Antimicrobial utilization data were classified according to the World Health Organization's Anatomical Therapeutic Chemical (ATC) classification system. Antimicrobial utilization rates were calculated as the defined daily dose (DDD) per 1000 inhabitants per day (DID), where DDD represents that average maintenance dose per day for a drug used in its main indication in adults.

#### Antimicrobial Resistance Data

Previously, data on antimicrobial resistance rates are compiled each year from a variety of regional, provincial and national sources including BC Biomedical Laboratories (BC Biomed), LifeLabs Medical Laboratory Services (LifeLabs), the BC Association of Medical Microbiologists (BCAMM), the Canadian Bacterial Surveillance Network (CBSN), the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS), and the BC Public Health Microbiology Reference Laboratory (BC PHMRL). Each of these organizations produces aggregate reports of antimicrobial resistance trends that are

regional/provincial/national in scope. As these data primarily represent isolates collected in the community, antimicrobial resistance trends reported here may differ from those reported for institutions. Non-susceptibility rates include both full resistance and intermediate resistance. Spearman rank tests are typically used to assess changes in trend over time.

As the DBND program continues to increase its online presence, new means of data visualization are being explored to report on resistance patterns based on isolate-level data obtained from community laboratories.

## Limitations

- Digital/television and transit advertising numbers are estimates provided to the DBND program by external contractors and represent the estimated viewer numbers and transit ridership numbers, respectively. However, the true uptake by our primary target audience group, women in BC aged 25-54, is unknown and the numbers reported here are likely conservative estimates.
- Teaching numbers and target audience groups for educational activities are estimated based on expected audience attendance and composition. Documentation forms for public teaching activities are submitted on a voluntary basis and likely represent underestimates of our true program reach.
- Print material distribution is tracked following shipment to health institutions. While shipment deliveries and intended receipt type are documented, the final end-user of these materials is unknown.
- For antimicrobial utilization, PharmaNet data are restricted to oral antimicrobials dispensed in outpatient settings. While these data comprehensively measure antimicrobial use in the community – the main focus of the DBND program – utilization rates for agents that are administered parenterally and/or primarily used in inpatient settings are likely underestimated.
- For antimicrobial resistance, susceptibility testing data from BC Biomedical Laboratories and LifeLabs Medical Services are limited to isolates submitted to outpatient laboratories; however, certain health authorities may be under-represented in these data. The methods used for testing bacterial isolates differed between the laboratories until mid-2015; different antimicrobials panels were used and different cascading algorithms were implemented for testing based on specimen type, age of patient and resistance to other antibiotics. While some susceptibility data are obtained from hospital-based laboratories through other partner organizations, these data are limited to select pathogens and do not offer a complete picture of antimicrobial resistance in inpatient settings.