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Do Bugs Need Drugs?
Annual Evaluation Report

2013/14

Prepared by:

Do Bugs Need Drugs?
September 2014

Provincial Health Services Authority
Province-wide solutions. Better health.

A research and teaching centre affiliated with UBC

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

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2013/14 Annual Evaluation Report

September 2014

Prepared for

British Columbia Ministry of Health,

Medical Beneficiary & Pharmaceutical Services Division

Drug Intelligence & Optimization Branch

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About this Report

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). 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 a media campaign, a health care professional and public education program, a public teaching program, and print material distribution. Program Outcome Evaluation includes surveillance of antimicrobial utilization and antimicrobial resistance trends in BC.

This report highlights program implementation and evaluation activities for the DBND program in BC for the 2013/14 fiscal year. Historical data from previous years' reports are presented to examine longer-term trends over time. Public teaching numbers are presented by school year (September to August) to correspond to the peak teaching periods for the DBND program, all other education activity numbers are presented by fiscal year (April to March). 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 Authority (IHA), Fraser Health Authority (FHA), Vancouver Coastal Health Authority (VCHA), Island Health (IH), 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 2013 population estimates (P.E.O.P.L.E. 2013)

Acronyms

ATC	Anatomical Therapeutic Chemical
BC	British Columbia
DBND	*Do Bugs Need Drugs?*
DDD	Defined Daily Doses
ECE	Early Childhood Educator
FHA	Fraser Health Authority
HA	Health Authority
IHA	Interior Health Authority
K-3	Kindergarten to Grade 3
NHA	Northern Health Authority
PSA	Public Service Announcement
VCHA	Vancouver Coastal Health Authority
IH	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 Pharmaceutical Services Division of the BC Ministry of Health as part of the overall DBND program implementation in BC. The current funding period ends in March 2017.

Executive Summary

This report summarizes the evaluation of the *Do Bugs Need Drugs?* (DBND) program in British Columbia (BC) for the 2013/14 fiscal year. Since its implementation in BC in the fall of 2005, the DBND program has been an important public health initiative. Evaluation of the DBND program encompasses **Program Process Evaluation** and **Program Outcome Evaluation** components.

Program Process Evaluation

- This year's paid **public transit advertising campaign** ran from August 26 to September 22, 2013, and was viewed an estimated 30 million times during this period in the Metro Vancouver area. Additional advertising ran from September 23 to October 6, 2013, at no charge to the DBND program; several ads remained up past the bonus time until the space was re-allocated.
- The **television advertisement campaign** ran for a five to six week period in January and February 2013 and featured two 15-second advertisements focusing on antimicrobial resistance and appropriate antimicrobial use. Target audience reach or exceeded 70% in all regional markets.
- A total of 45 health care professional and public education sessions were held during the 2013/14 fiscal year, including two **Public Education** session with members of the general public, nine **Continuing Education** sessions with health care professionals, and 32 **Train-the-Trainer** sessions to teach health care professionals and students how to deliver the DBND public teaching components.
- During the 2013/14 fiscal year, 430 public teaching sessions were taught to over 9,500 individuals across the province. By program component, 229 **Grade 2** sessions were taught to 5,162 children; 41 **Daycare** sessions were taught to 704 children; 13 **Older adult** sessions were taught to 448 staff and residents in long-term care; 80 **General Teaching** sessions were taught to 1,800 individuals; and 67 sessions under the **K-3 Teacher Resources** component were provided to 1,662 children.
- In 2013, over 75,000 **print materials**, including activity placements, stickers, signs and posters, parent guides, and pamphlets, were distributed across the province.
- The 2012 edition of the ***Bugs and Drugs*** book has been distributed to 14,700 health care professionals (12,570 hardcopies and 2,130 iPhone Apps), as of June 3, 2014.

Program Outcome Evaluation

- A community-based, online survey was conducted to assess public knowledge, attitudes, and behaviour in relation to DBND program messaging. High levels of outreach messaging were observed (e.g. 71% of respondents had reported ever seeing DBND promotional material). In addition, high levels of awareness of appropriate antibiotic usage were also noted (e.g. 76% of respondents reported that they did not believe an antibiotic would help them get better if they had a cold).
- A comprehensive summary of antimicrobial utilization trends in the province of BC is currently being complied in a separate report entitled “British Columbia Annual Summary of Antibiotics Utilization.” The most recent version of this report (2010) is available from our website: www.bccdc.ca/dbnd.
- A comprehensive summary of antimicrobial resistance trends in the province of BC currently being complied in a separate report entitled “Antimicrobial Resistance Trends in the Province of British Columbia.” The most recent version of this report (2012) is available from our website: www.bccdc.ca/dbnd.

Introduction

Human antibiotic use is a known driver of antibiotic resistance.[1,2] Although antibiotic resistance is a naturally occurring biological phenomenon, it has been exacerbated by the abuse, overuse and misuse of antibiotics. 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,[3,4,5] public health campaigns to raise awareness about antibiotic resistance and inappropriate antimicrobial therapy,[6] and administrative restrictions and policies such as formulary restrictions.[7,8] 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.4

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). 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 2013/14 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 antimicrobial 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 are 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. **Changes in Knowledge, Attitudes, and Behaviour.** Pre- and post-assessments of the public and health care professionals knowledge and attitudes regarding antibiotic use and resistance in relation to the program.
3. **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.
4. **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 antimicrobial 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 on our website: www.bccdc.ca/dbnd. Updated versions of these reports are anticipated later this year.

Peer-reviewed publications related to the DBND program publication evaluating the addition of moxifloxacin to the BC provincial drug formulary was published in the *Canadian Journal of Infectious Diseases and Medical Microbiology* in February 2014[9]. A manuscript based on results of an analysis examining an organism-specific drug resistance index was accepted for publication in the Canadian Journal of Infectious Diseases & Medical Microbiology in July 2014 (currently in press). The initial analysis was later modified to include a syndrome-specific drug resistance index and presented at ID Week in San Francisco, CA, in October 2013 then again at the BCCDC Research Week in November 2013.

Over the 2013/14 fiscal year, resources were added to the BC DBND webpage which provide information on the management of urinary and respiratory tract infections in long term care (see http://www.bccdc.ca/prevention/AntibioticResistance/DBND/Resources/default.htm). Similarly, information and guidance around community acquired MRSA infections were added to the antimicrobial resistance section of the BCCDC webpage through a collaborative project between DBND and UBC (see http://www.bccdc.ca/prevention/AntibioticResistance/MRSA/default.htm).

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.

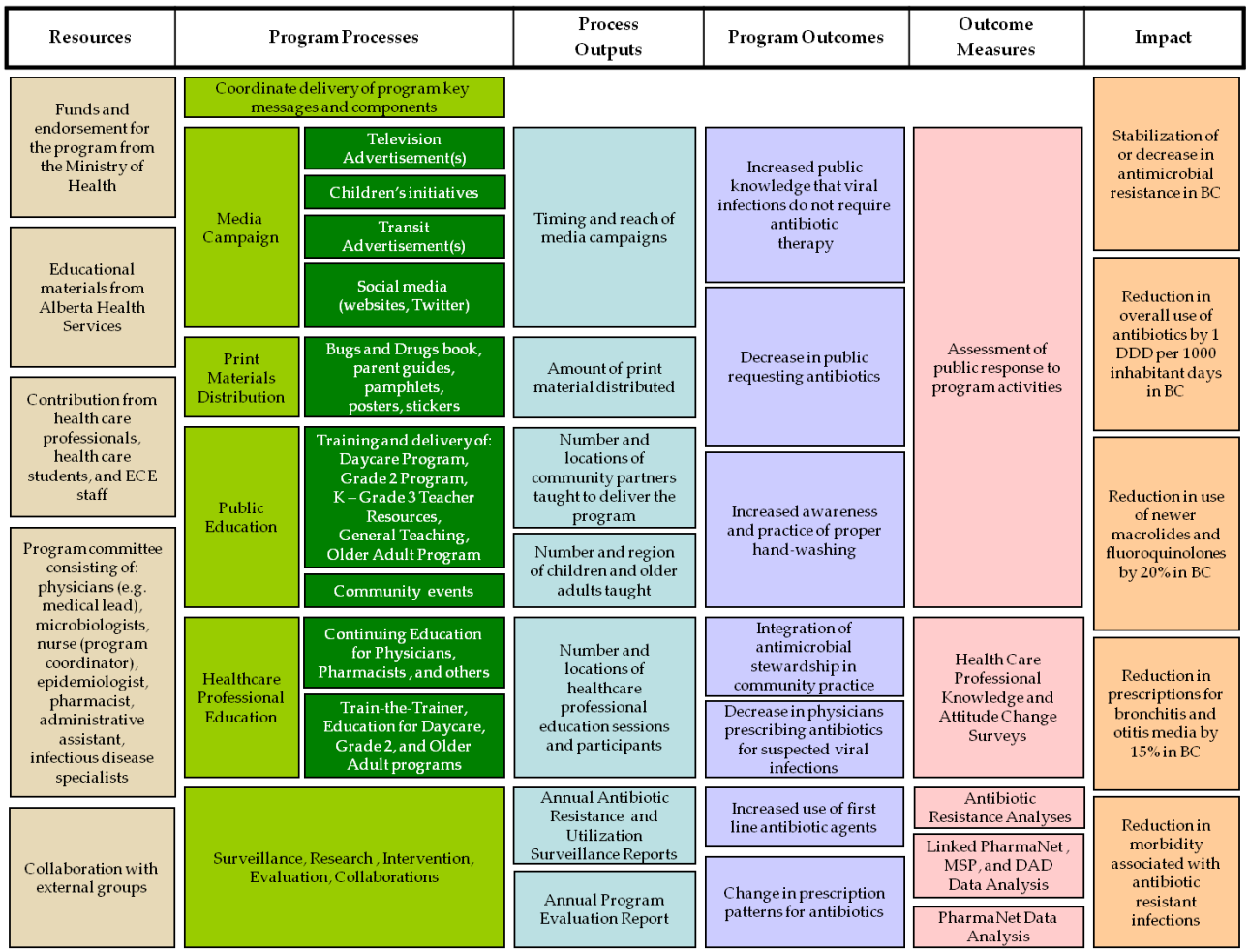

Figure 2. Program logic model (revised June 2014)

Program Process Evaluation

Media Campaign

The DBND media campaign is composed of three major advertisement campaigns: 1) public transit, 2) television, and 3) children's initiatives. Since implementation in 2006 (television) and 2007 (public transit), these 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, and doctors and other health care professionals. The children's media initiatives are targeted toward young children aged 2-11 and their parents through co-viewing.

In response to suggestions from stakeholders following our 2010 Annual DBND Stakeholder Advisory Committee Meeting, media messaging moved away from the focus on hand washing to again include messaging focused on antimicrobial resistance and appropriate antimicrobial use. Accordingly, new media campaign material was developed, including new transit advertising posters (see Appendix) and a new television advertisement, which was developed in collaboration with the Vancouver Film School students and graduates. These advertisements ran during the fall 2013 transit advertising campaign and the 2014 television advertising campaign.

Public Transit Advertisement Campaign

This year's paid public transit advertising campaign ran from August 26 to September 22, 2013. Additional advertising ran from September 23 to October 6, 2013 at no charge to the DBND program with many ads remaining in use until the space was re-allocated to another client. A total of 495 advertisements were posted during this year's campaign: 26 advertisements on the Skytrain in Metro Vancouver, 16 advertisements on the Canada Line in Metro Vancouver, and 453 advertisements on buses in Metro Vancouver, Victoria, and Kelowna (**Table 1**). In 2013, headliners (ads on the upper side of the bus) were also included to the exterior of the buses.

Ridership was estimated at 10.6 million people on the Expo Skytrain line and 3.0 million people on the Millennium Skytrain line for the months of September and October in 2013; ridership on the Canada Line during the same time period was 6.2 million people.[10] Average ridership for buses in Oakridge/Vancouver totalled 7.2 million people per month in 2013. In addition, average ridership in North Vancouver was estimated at 1.0 million people per month, in Surrey at 2.8 million per month, and in Richmond at 2.2 million per month.[10]

Table 1. Number of public transit advertisements posted by type of transit and type of advertisement, fall 2013

Type of Transit	Type of Advertisement*				TOTAL
	Platform Posters	Exterior Cards (Trains)	Interior Cards (Buses)	Exterior Cards (Buses)	
Skytrain (Vancouver)	18	8	-	-	**26**
Canada Line (Vancouver)	12	4	-	-	**16**
Buses (Vancouver)	-	-	193	39	**232**
Buses (Victoria)	-	-	150	16	**166**
Buses (Kelowna)	-	-	47	8	**55**
TOTAL	**30**	**12**	**390**	**63**	**495**

* Skytrain platform posters are 70.75" x 45" and are placed on Skytrain and Canada Line platforms. Exterior cards (trains) are 36" x 444" and are placed on the exterior of Skytrains and Canada Line trains. Interior cards (buses) are 11" x 35" and are placed in the interior of buses. Exterior cards (buses) are 39" x 140" and are placed on the exterior of buses; exterior cards in the 2013/14 fiscal year include both upper and lower sides of the bus, exterior cards of all previous years used the lower side only.

Television Advertisement Campaign

The television advertisement campaign ran for a five to six week period (depending on the station) in January to March, 2013. As described above, this year's campaign featured two 15-second television advertisements focusing on antimicrobial resistance and appropriate antimicrobial use, based on the VFS students' design.

A television campaign Post Buy Summary was provided by Hallamedia Inc.[11] Target audience reach and average viewing times among women aged 25-54 by regional market are provided in **Table 2**. Regional market coverage included Metro Vancouver/Vancouver Island, Kelowna, the Kootenays, Prince George/Kamloops, Terrance/Kitimat, and Dawson Creek.

Table 2. Target audience reach and average viewing times among women aged 25-54 by regional market, January to February 2014

Regional Market	Television Networks	Percent of Target Audience Reached*	Average Number of Times Viewed / Campaign Period
Vancouver/ Vancouver Island	CTV, Global, CITY	82%	19.5 times / 6 weeks
Kelowna	CHBC-TV and CHAN1-O television networks	75%	14.6 times / 5 weeks
The Kootenays**	CHAN1-K television network	-	-
Prince George/ Kamloops	iNTV, CHAN1-PG, and CTV-PG television networks	70%	9.4 times / 5 weeks
Terrance/Kitimat	CFTK, CHAN1-TK, and CTV-TK television networks	70%	9.7 times / 5 weeks
Dawson Creek	CJDC and CHAN1-DC television networks	70%	10.0 times / 5 weeks

* Percentages do not include public service announcement (PSA) time that may have occurred when the television advertisements ran over and above the negotiated contracts.

** The market of the Kootenays is no longer measured through the Broadcast Bureau of Measurement due to small sample sizes

Children's Media Initiative

As part of the children's media initiative, additional television media coverage was purchased on the province-wide Knowledge Network for an eight-week period from January to March 2014. As with the general television advertisement campaign, this year's campaign featured two 15-second advertisements focusing on antimicrobial resistance and appropriate antimicrobial use. Target audiences included children aged 2-11 and mothers through co-viewing. Rating numbers are not available for children in this age group due to sample size limitations and research methodology requirements.

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. Only 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.

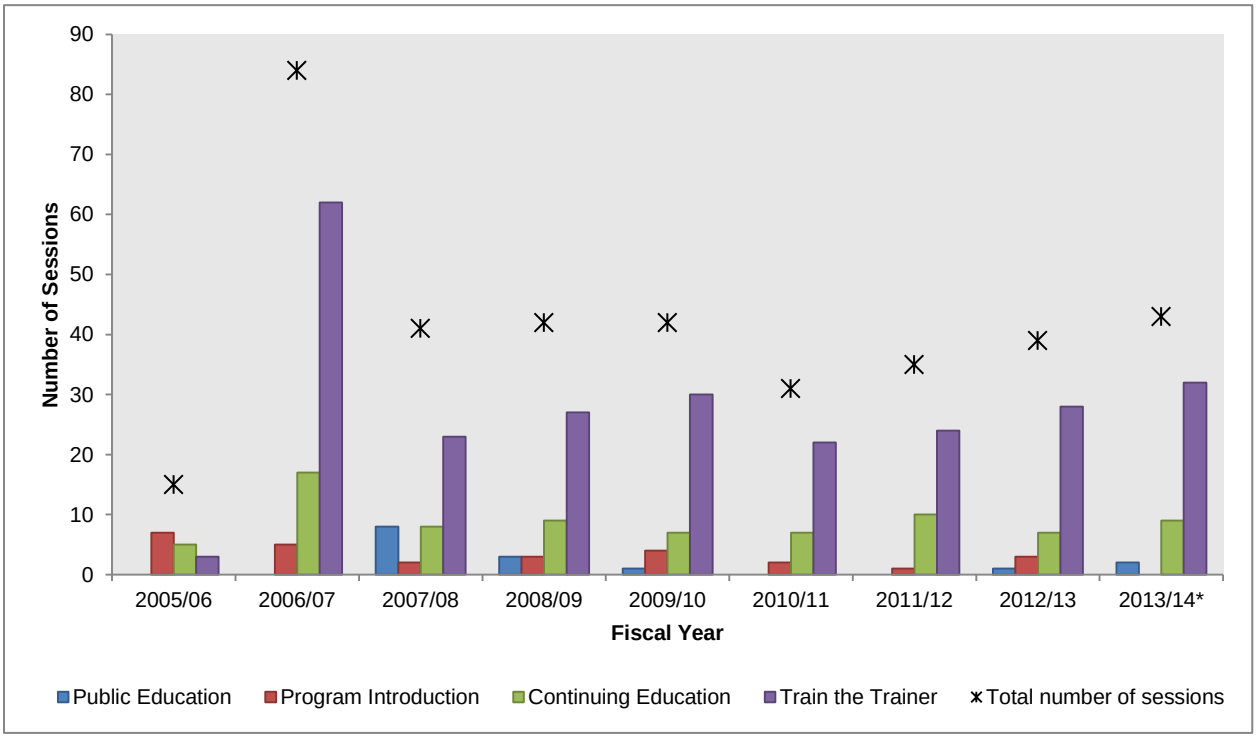

Figure 3. Number of education sessions by type of session and fiscal year, 2005/06 to 2013/14

*In 2014, other sessions (not presented) include a presentation to the Senate Committee on Unintended Consequences of Antibiotic Use, which was broadcast across the nation, and a discussion with the Auditor General of Canada on the role of the federal government in managing issues of antimicrobial resistance in Canada.

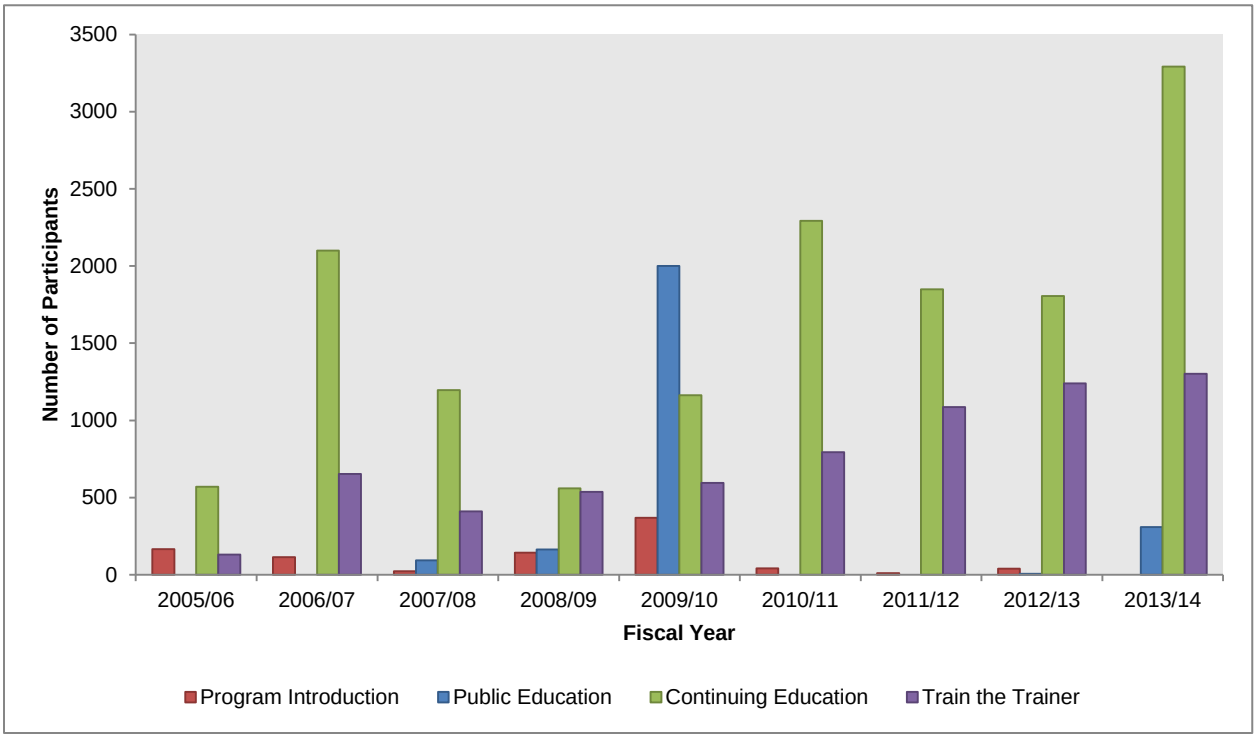

Figure 4. Number of participants attending education sessions by type of session and fiscal year, 2005/06 to 2013/14*

* Only target audience participants are included in the figure; a total estimate of 1136 individuals have participated in sessions as other audience members since program inception in BC.

Public Education and National Action

The Public Education sessions are targeted towards members of the general public. These sessions are a means of providing an overview of the DBND program and its three key messages and distributing print materials. Since implementation of the DBND program during the 2005/06 fiscal year, 15 Public Education sessions have been held (**Figure 3**). These sessions were attended by a total of 2,571 participants (**Figure 4**). The large number of participants during the 2009/10 fiscal year represents educational activities provided as part of the Vancouver International Children's Festival. During the 2013/14 fiscal year, two Public Education sessions were held, attended by 308 members of the general public. One of these sessions involved a DBND booth set-up at the 2014 Vancouver Diversity Health Fair.

The team has been active across the country in promoting better standards of antibiotic stewardship.

A national review of surveillance for antibiotic resistance and antibiotic use was lead by the DBND medical lead and provincial partners and resulted in a number of recommendations that will define future directions in this area, at a national level. In addition, the DBND medical lead participated in briefing a Senate Committee on antibiotic resistance. The briefing generated great interest at the Public Health Agency of Canada, among the media and the general public and resulted in recommendations to Parliament.

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, 27 Program Introduction sessions have been held (**Figure 3**). These sessions were attended by a total of 909 participants (**Figure 4**). No Program Introduction sessions were held during the 2013/14 fiscal year.

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 79 Continuing Education sessions (**Figure 3**). The estimated number of health care professionals at these sessions, and who potentially were exposed to components of the DBND program, is 14,828 individuals (**Figure 4**). During the 2013/14 fiscal year, DBND team members presented at nine Continuing Education sessions. The estimated number of health care professionals was 3,292 individuals, the majority (>80%) of whom were physicians (**Table 3**).

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, 219 Train-the-Trainer sessions have been held (**Figure 3**). 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, 5,444 participants have attended Train-the-Trainer sessions (**Figure 4**). During the 2013/14 fiscal year, 28 Train-the-Trainer sessions were provided to 1,240 participants. The majority of these participants were either nursing students (70%) or medical students (23%) (**Table 3**).

Table 3. Number of target audience participants by target audience and year, 2013/14 fiscal year*

Target Audience**	Public Education, n (%)	Train the Trainer, n (%)	Continuing Education, n (%)
Public	308 (100)	-	-
Assisted Living Staff	-	16 (1)	-
Early Childhood Educators	-	0 (0)	-
ECE Students	-	18 (1)	-
Medical Students	-	288 (22)	-
Nursing Students or Instructors	-	925 (71)	-
Pharmacists	-	6 (0.5)	-
Pharmacy Students	-	-	242 (7)
Physicians	-	-	2,800 (85)
More than one main target audience†		48 (7)	250 (8)
TOTAL	**308 (100)**	**1,301 (100)**	**3,292 (100)**

* Fiscal year 2013/14 numbers are accurate as of June 3, 2014.
** Only target audience participants are included on figure; a total of 152 individuals have participated in health care professional and public education sessions as other audience members during the 2013/14 fiscal year.
† 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

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.

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 662 sessions have been taught to 10,846 children across the province (**Figure 5**). During the 2013/14 school year, 41 Daycare sessions were taught to 704 children across the province, including 342 (49%) children in IHA, 89 (13%) in FHA, 130 (18%) in IH, 81 (12%) in NHA, and 62 (9%) in VCHA.

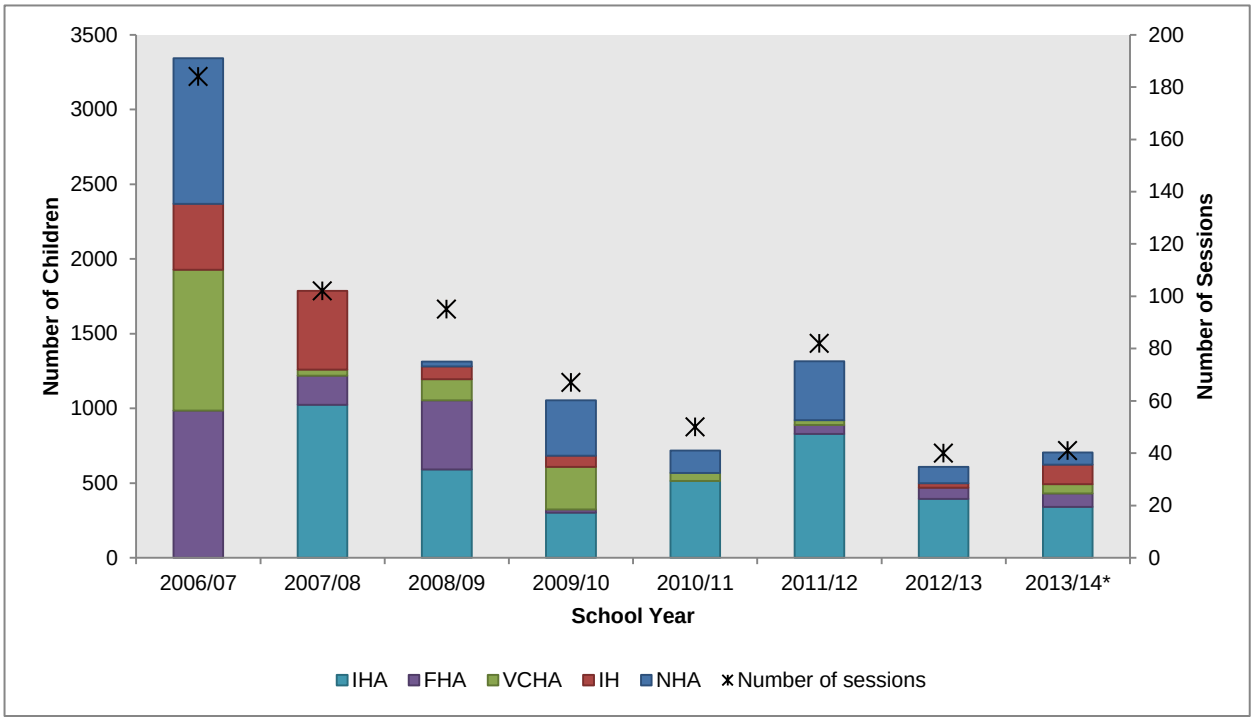

Figure 5. Number of children taught under the Daycare Program by Health Authority and school year, 2006/07 to 2013/14[†]

* School year 2013/14 numbers are accurate as of June 13, 2014.
[†] One additional Daycare session (consisting of 4 children) was taught in school year 2005/06 in FHA; these numbers are not shown on the figure.

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 VCHA 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, IH in the winter of 2007 and IHA in the spring of 2007.

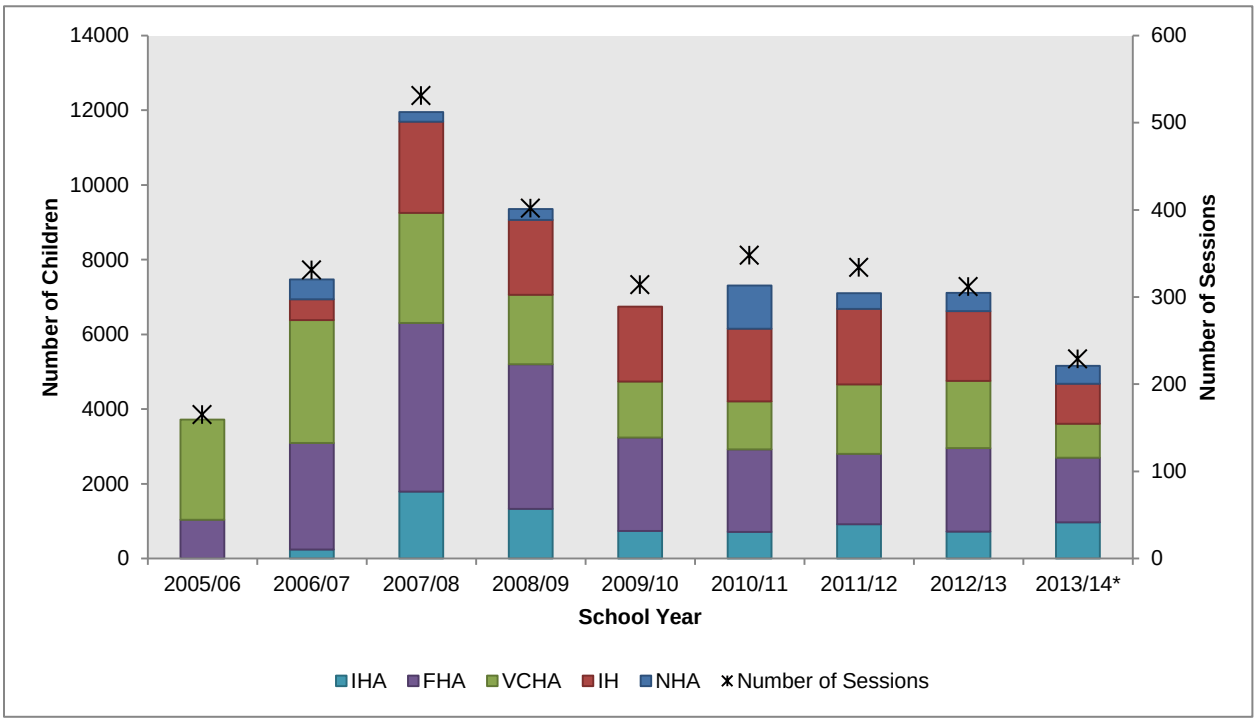

Figure 6. Number of children taught under the Grade 2 Program by Health Authority and school year, 2005/06 to 2013/14

* School year 2013/14 numbers are accurate as of June 3, 2014.

During the 2013/14 school year, 229 Grade 2 sessions were taught to 5,162 children across the province. By Health Authority, the majority of children were taught in FHA (n=1,726; 33%), IH (n=1,074; 21%), IHA (n=974; 19%), and VCHA (n=908; 18%), with smaller numbers of children being reported in NHA (n=480; 9%). Most of these sessions for 2013/14 were taught by nursing students, medical students or pharmacists/pharmacy technicians (**Table 4**).

Table 4. Number of sessions taught under the Grade 2 Program by designation of person providing teaching and school year, 2013/14

Designation of Person Providing Teaching	2013/14 School Year,* n (%)	All Years, n (%)
Nursing Student	157 (69)	1868 (63)
Pharmacist/Pharmacy Technician	29 (13)	637 (21)
Nurse	0 (0)	244 (8)
Medical Student	43 (19)	146 (5)
Teacher	0 (0)	30 (1)
Other	0 (0)	40 (1)
TOTAL†	**229 (100)**	**2965 (100)**

* School year 2013/14 numbers are accurate as of June 3, 2014.
† Designation of an individual providing teaching was missing for one Grade 2 teaching session in 2008/09.

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 school year.

Since implementation of the K-3 Teacher Resource Program, a total of 156 sessions have been taught to 3,635 children across the province (**Figure 7**). During the 2013/14 school year, 67 sessions were taught to 1,662 children. Most of these children taught were in FHA (n=1,215; 73%), with smaller numbers of children being taught in NHA (n=263; 16%) or IHA (n=184; 11%). No K-3 Teacher Resource Program sessions were held in VCHA or IH during the 2013/14 school year.

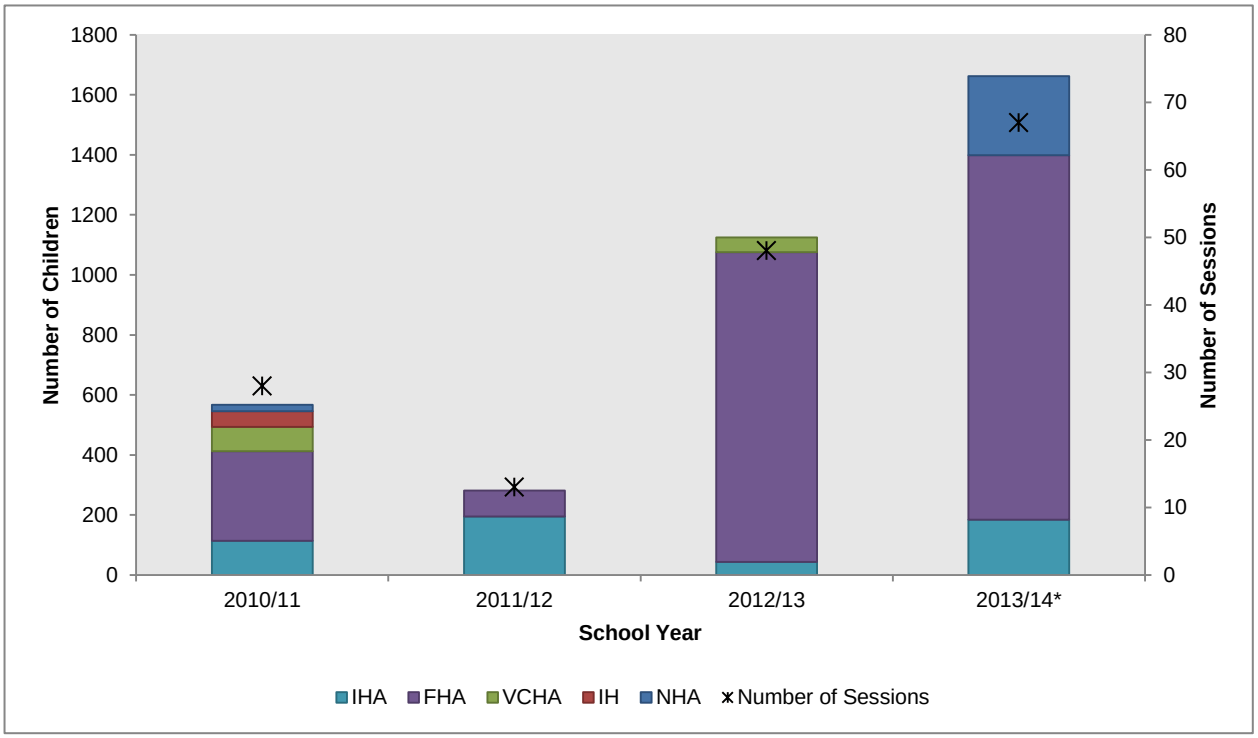

Figure 7. Number of children taught under the K-3 Teacher Resource Program by Health Authority and school year, 2010/11 to 2013/14

* School year 2013/14 numbers are accurate as of June 3, 2014.

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 423 sessions have been taught to 10,214 children across the province under the General Teaching Program (**Figure 8**). The General Teaching Program was initiated during the 2009/10 school year after realizing that instructors were adapting the DBND Daycare, Grade 2, and Older Adult program components to meet 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.

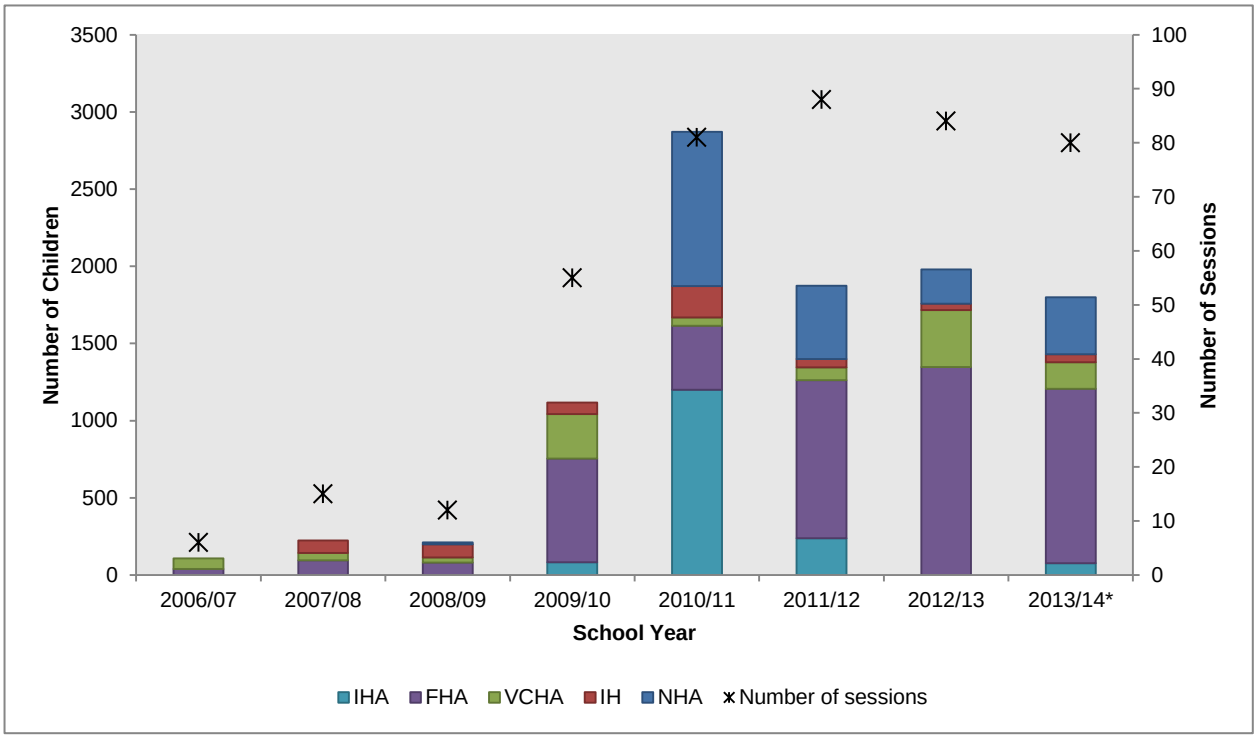

Figure 8. Number of children taught under the General Teaching Program by Health Authority and school year, 2006/07 to 2013/14[†]

* School year 2013/14 numbers are accurate as of June 3, 2014.
[†] An additional two General Teaching sessions (28 children total) were taught in school year 2005/06 both in VCHA; these numbers are not shown on the figure.

During the 2013/14 school year, 80 General Teaching sessions were taught to 1,800 children. By Health Authority, General Teaching sessions were taught to 1,130 (63%) children in FHA, 172 (10%) in VCHA, 77 (4%) in IHA, 51 (3%) in IH, and 370 (21%) in NHA. Nursing students taught the majority of these sessions (90%) during the 2013/14 school year (**Table 5**).

Table 5. Number of sessions taught under the General Teaching Program by designation of person providing teaching and school year, 2013/14

Designation of Person Providing Teaching	2013/14 School Year,* n (%)	All Years, n (%)
Nursing Student	78 (98)	349 (86)
Nurse	0 (0)	20 (5)
Pharmacist/Pharmacy Technician	0 (0)	10 (3)
Teacher	0 (0)	3 (1)
Medical Student	0 (0)	2 (1)
Other	2 (2)	20 (5)
TOTAL	80 (100)	404 (100)

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 school year (September to August) to align with the Grade 2 and Daycare reporting.

Since implementation of the Older Adult Program in 2008, a total of 114 sessions have been taught to 2,249 individuals across the province, including 570 staff, 1,564 residents, and 115 other individuals, (**Figure 9**; **Table 6**). 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 6. Number of individuals taught under the Older Adult Program by target audience and school year, 2008/09 to 2013/14

Target Audience	School Year						All Years
	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14*	
Staff	105	229	88	17	48	83	570
Residents	179	461	454	39	67	364	1564
Other	24	72	13	2	3	1	115
TOTAL	**308**	**762**	**555**	**58**	**118**	**448**	**2249**

* School year 2013/14 numbers are accurate as of June 3, 2014.

During the 2013/14 school year, a total of 13 Older Adult sessions were held across all Health Authorities. Audience members during these sessions included 83 staff (19%), 364 residents (81%), and 1 other individual. By Heath Authority, the Older Adult Program was taught to 270 (60%) individuals in IH, 69 (15%) individuals in FHA, 57 (13%) in IHA, 43 (10%) at NHA, and 9 (2%) in VCHA (**Figure 9**). Most of these sessions during the 2013/14 school year were taught by nurses or nursing students (10 sessions) (**Table 7**).

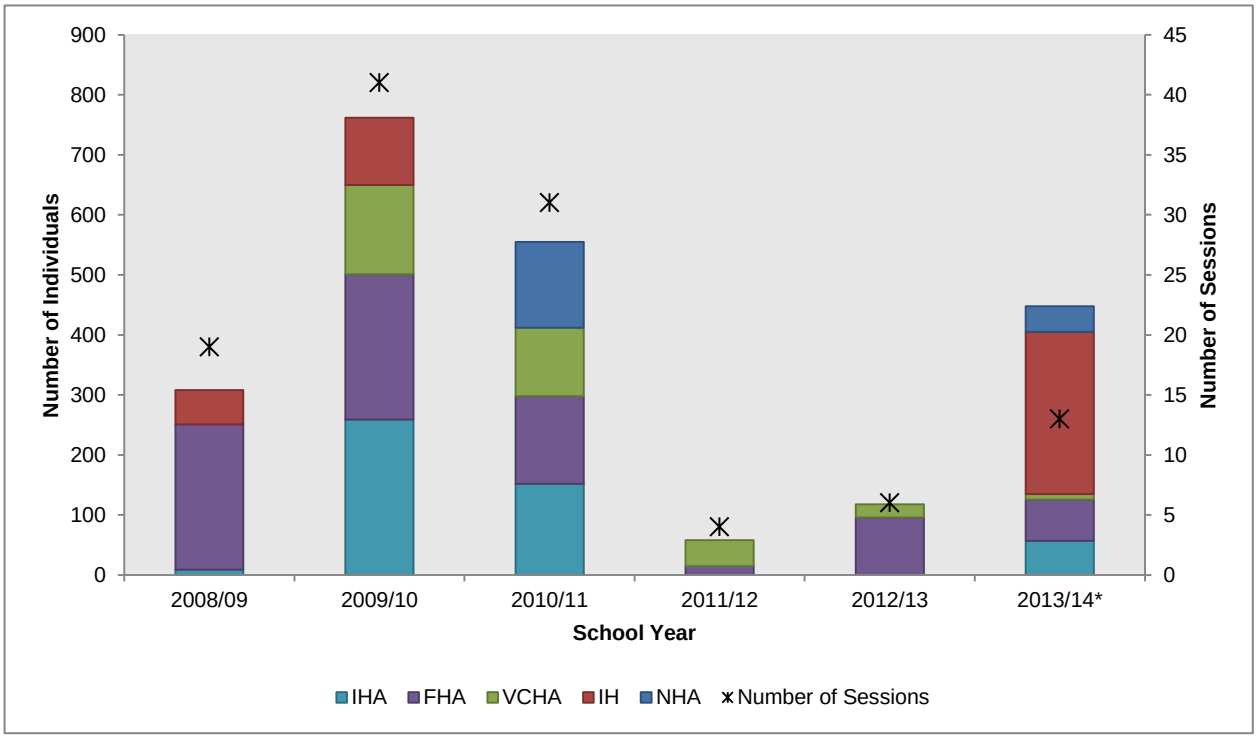

Figure 9. Number of individuals (includes staff, residents, and other individuals) taught under the Older Adult Program by Health Authority and school year, 2008/09 to 2013/14

* School year 2013/14 numbers are accurate as of June 3, 2014.

Table 7. Number of sessions taught under the Older Adult Program by designation of person providing teaching and school year, 2013/14

Designation of Person Providing Teaching	2013/14 School Year* n (%)	All Years, n (%)
Nurse	4 (31)	48 (42)
Nursing Student	6 (46)	19 (17)
Care aide	0 (0)	5 (4)
Recreational Therapist	0 (0)	4 (4)
Teacher	3 (23)	3 (3)
Manager	0 (0)	8 (7)
Site Leader	0 (0)	2 (2)
Pharmacist/Pharmacy Technician	0 (0)	1 (0)
Other	0 (0)	24 (21)
TOTAL	13 (100)	114 (100)

* School year 2013/14 numbers are accurate as of June 3, 2014.

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, over 1.3 million print materials have been distributed across the province and elsewhere. The largest number of print materials was distributed in the first two years, as the DBND program was fully implemented across the province (**Figure 10**). Since then, print material distribution numbers have decreased to more sustainable levels. By type of material, 150,597 activity placemats, 261,871 stickers, 82,417 signs and posters, 447,977 parent guides in English, 43,838 parent guides in other languages, and 375,111 pamphlets have been distributed since 2005/06.

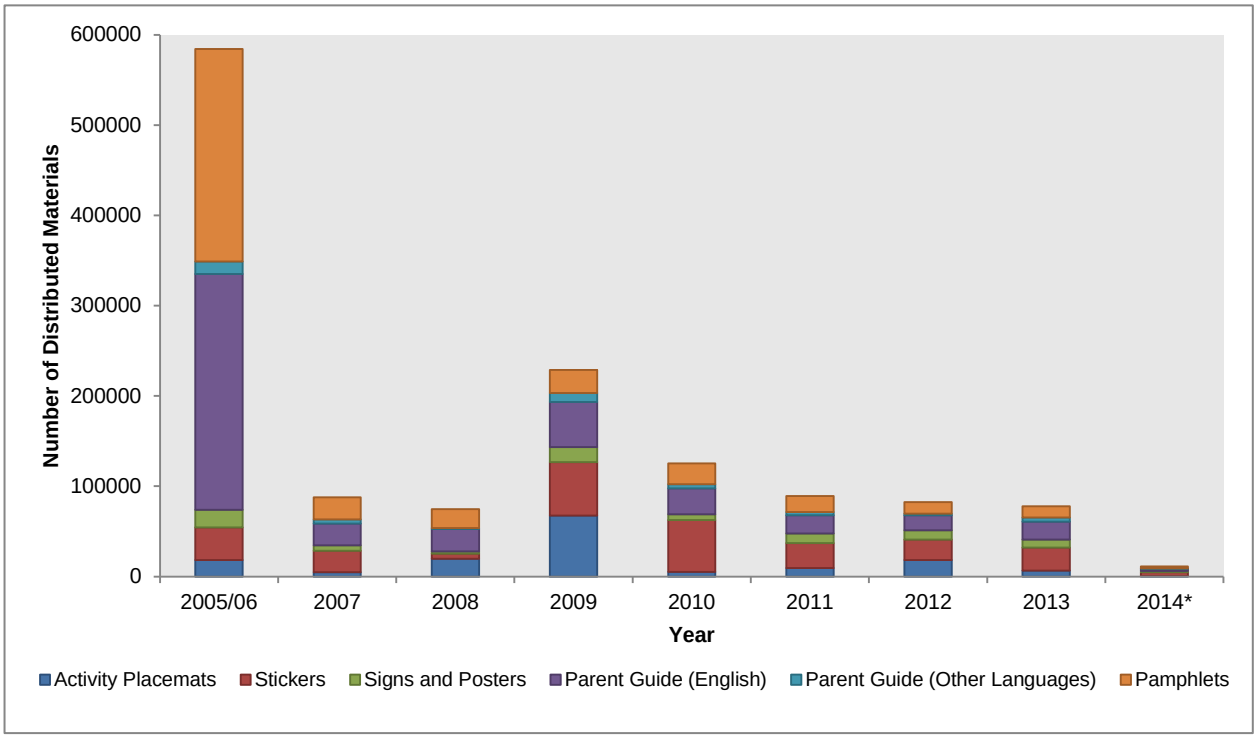

Figure 10. Print material distribution by type of material and year, 2005/06 to 2014*

* Includes print material distribution up to end of fiscal year (March 31, 2014).

In 2013, over 75,000 print materials were distributed across the province: 6,4604 activity placemats, 25,617 stickers, 9,030 signs and posters, 19,705 parent guides in English, 4,477 parent guides in other languages, and 12,600 pamphlets were distributed across the province.

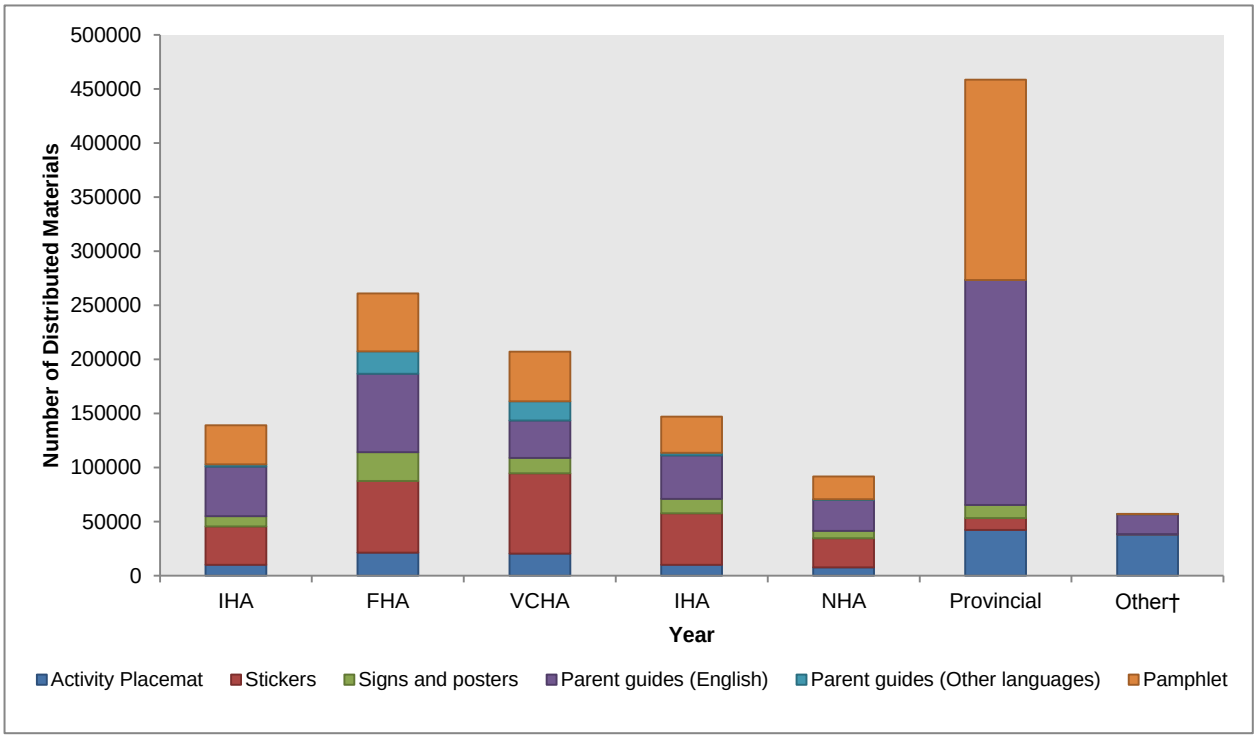

Figure 11. Print material distribution by type of material and Health Authority since 2005/06*

* Includes print material distribution up to end of fiscal year (March 31, 2014).
† Other distribution includes print material distribution out-of-province, nationally, and internationally.

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, 19% of total print materials were distributed in FHA, 15% in VCHA, 11% in IH, 10% in IHA, and 7% in NHA, with the remaining 38% distributed either provincially or to other national or international organizations (**Figure 11**).

Bugs and Drugs Book

The distribution of the fifth edition (2012) of the *Bugs and Drugs* antimicrobial/infectious diseases reference book continued this year, targeting physicians, medical residents, nurse practitioners, naturopaths, midwives, infection control sites, independent pharmacies, First Nations nursing stations, and healthcare students in medicine, dentistry, pharmacy, naturopathic medicine, midwifery, and the nurse practitioner program.[12] In the latest edition, the number of indications where macrolides or quinolones are recommended as therapy has been substantially reduced, due to concerns over increased resistance to these drug classes. The *Bugs and Drugs* reference is available as either a hardcopy book or as an iPhone or Android App. Only the hardcopy book and iPhone App are being provided complimentary by the DBND program through funding from the BC Ministry of Health. The hardcopy book is also available for purchase through Amazon.com; the iPhone App can be purchased through the iTunes store; and the Android App can be purchased through Google Play.

As of June 3, 2014, over 14,000 copies of the Bugs and Drugs resource had been distributed: 12,570 hardcopies and 2,130 iPhone apps. A breakdown of the distribution numbers by target group is provided in **Table 8**.

Table 8. Distribution of the *Bugs and Drugs* reference by type of material and target group*

Target Group	Hardcopy Books	iPhone Apps	TOTAL
Physicians	1,846	1,407	3,253
Nurse practitioners	198	4	202
Medical residents and students	1,903	710	2,613
Other health care professional residents and students†	1,826	1	1,827
Pharmacists participating in academic detailing program‡	860	8	868
Pharmacists and pharmacies	2,150	0	2,150
Infection control practice sites	49	0	49
Dentists	3,090	0	3,090
Naturopaths	420	0	420
Midwives	205	0	205
Other	23	0	23
TOTAL	**12,570**	**2,130**	**14,700**

* Includes Bugs and Drugs book distribution up to June 3, 2014. Numbers may have decreased in comparison to previous years' reports due to the return of books not distributed.
† Includes residents and students in dentistry, pharmacy, and nurse practitioner programs.
‡ Books provided to pharmacists participating in the BC Ministry of Health's academic detailing program are meant for distribution to physicians.

Program Outcome Evaluation

2013/14 Annual Evaluation Report

Public Knowledge, Attitudes, and Behaviours

During BC DBND program implementation in 2005/06, a community-based, telephone survey was conducted to measure changes in knowledge, attitudes, and behaviours associated with antibiotic use before and after the initial DBND media campaign.

Following the media campaign in February and March of 2014, Ipsos Reid, an independent market research company, was contracted to conduct a subsequent online, community survey to further evaluate the impact of DBND outreach activities, such as the media campaign, within BC. Due to methodological differences between telephone and online survey implementation, direct comparisons between survey results were deemed inappropriate; highlights of the 2014 survey are presented below[13].

Program messaging outreach

- Among the 1002 BC respondents of the survey, 71% reported having ever seen DBND promotional material; overall, 54% and 21% reported seeing commercials on the television and/or transit ads, respectively.

Increased public knowledge that viral infections do not require antibiotic therapy

- Overall, 73% and 82% correctly reported that viruses are the cause of colds or the flu, respectively
- Three quarters (76%) of respondents reported that they did not believe an antibiotic would help them get better if they had a cold; when asked about the flu, 66% correctly reported that they did not think an antibiotic would help them get better
- Half the respondents (52%) reported that there were no advantages or benefits to antibiotics, with regards to a cold or the flu, or that antibiotics only help with bacterial infections
- Overall, the majority of respondents (71%) reported they would not expect an antibiotic from a doctor for a sore throat, earache, or cough, which are typically viral infections

Increase in awareness and practice of proper hand-washing

- When asked to list two things that could prevent the spread of a cold or the flu, 68% of respondents listed washing their hands as one of their two responses. A higher proportion of respondents who reported ever having seen *Do Bugs Need Drugs?* promotional materials listed washing their hands as a means to prevent the spread of infection compared to respondents who had reported not seeing any DBND promotional material (72% vs. 58% respectively).

Increase in awareness of antibiotic resistance

- The majority of respondents (83%) reported that they had heard of antibiotic resistance; significantly more respondents who have seen DBND promotional materials than those who have not seen the materials reported that they are aware of antibiotic resistance (87% vs.74% respectively).
- Overall, 77% of respondents attributed the cause of antibiotic resistance to the overuse/misuse of antibiotics
- When asked about the disadvantages of antibiotics use for a cold or flu, 62% included the development of antibiotic resistance or mutations, ineffectiveness against viral infections or the creation of superbugs in their responses

Trends in Antimicrobial Utilization

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.

A comprehensive summary of antimicrobial utilization trends in the province of BC is complied in a separate report entitled "British Columbia Annual Summary of Antibiotics Utilization." The most recent version of this report (2010) is available from our website (http://www.bccdc.ca/prevention/AntibioticResistance/Surveillance/default.htm).

An updated report including data up to 2013 is currently being prepared; however, indication-specific data is currently unavailable. Due to changes in data, results may differ than those previously reported. Preliminary results from this forthcoming report are summarized here:

- Since implementation of the DBND program, overall antibiotic consumption decreased by 7.5% from 17.3 DDD/1000 population/day in 2005 to 16.0 DDD/1000 population/day in 2013 (**Figure 12**).
- In 2013, antibiotic consumption by class was highest for penicillins, followed by macrolides, tetracyclines, cephalosporins, quinolones, and lastly sulfonamides and trimethoprim.
- By drug class, overall consumption rates remained relatively stable for penicillins and tetracyclines between 2005 and 2013. In contrast, consumption rates for cephalosporins, sulfonamides and trimethoprim, quinolones, and macrolides decreased slightly over the same time period.
- The rate of antibiotic prescriptions decreased (by approximately 25%) among children 0 to 14 years of age, while the rate of consumption remained fairly stable among most adult age groups between 2005 and 2013, with declining trends observed among adults 15 to 29 years of age.
- Among children, those 1 to 4 years of age had the highest rate of prescriptions in 2013 (1.9 prescriptions/1000 population/day). Among adults, those 60 years and older were the greatest consumers of antimicrobial therapy in the outpatient setting in 2013 (21.7 prescriptions/1000 population/day).
- Antibiotic consumption among females consistently exceeded consumption among males by approximately 20% of total consumption.
- In 2013, antibiotic consumption rates in BC were highest in FHA and IHA (6.5% and 3.5% above the provincial average, respectively). Consumption rates in IH were comparable to the provincial average whereas NHA and VCHA were below by 4% and 12%, respectively.
- In 2013, lowest antibiotic consumption was in Richmond (13.3 DDD/1000 population/day), while the highest rate was in Fraser East (18.3 DDD/1000 population/day).

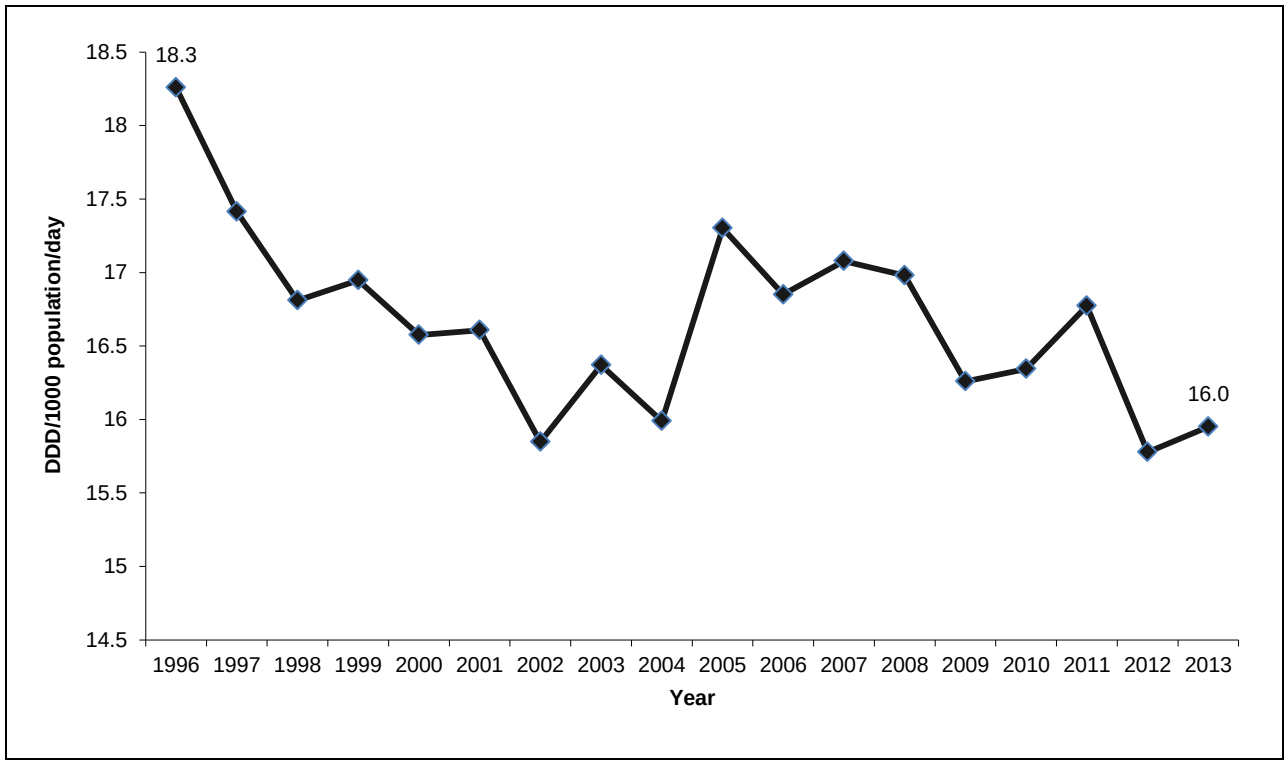

Figure 12. Overall antibiotic daily consumption rates from 1996 to 2013

Trends in Antimicrobial Resistance

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.

A comprehensive summary of antimicrobial resistance trends in the province of BC is complied in a separate report entitled "Antimicrobial Resistance Trends in the Province of British Columbia."
The most recent version of this report (2012) is available from our website (http://www.bccdc.ca/prevention/AntibioticResistance/ReportsandPublications/default.htm).

An updated report including data up to 2013 is currently being prepared. LifeLabs Medical Laboratory Services (LifeLabs) data from 2008 to 2013 will be included this year for the first time, in addition to BC Biomedical Services (BC Biomed) data analyzed previously. LifeLabs provides services primarily to Vancouver Mainland and the Island whereas BC Biomed provides services primarily in Fraser. Highlights from this forthcoming report are summarized here:

- From 2008 to 2013, the proportion of *Staphylococcus aureus* that were methicillin-resistant (MRSA) fluctuated between 16.1% and 27.9% (BC Biomed), 13.04% and 19.32% (Lifelabs-Island), and 21.21% and 27.72% (Lifelabs- Mainland); however, resistance rates remained below the peak observed in 2008. A quarter of *S. aureus* isolates (23.2%) in 2013 were MRSA (BC Biomed); similar results were observed in Mainland whereas a lower rate (13.04%) was observed on the Island.
- Data from BC Biomed shows that during 2013, MRSA isolates demonstrated high to moderate levels of resistance to erythromycin (82.8%) and clindamycin (38.6%) but considerably lower rates of resistance to TMP-SMX (1.4%), tetracyclines (6.7%), and mupirocin (2.8%). Susceptibility to linezolid, a recommended second-line antibacterial treatment of community associated MRSA complications, remained at around 100% (data not shown). Similar trends were observed in both Mainland and Island data.
- Resistance of *Escherichia coli* to ciprofloxacin, a commonly prescribed antibiotic for treatment of urinary tract infection, has shown a slight yet significant increase over the years and is currently at 24.9% in 2013 ($p<0.01$, BC Biomed) (**Figure 13**). A similar trend is observed for Mainland data, however a decreasing trend is observed for data obtained from the Island. *E.coli* isolates demonstrated moderate levels of resistance to TMP-SMX, with a rate of 25.2% in 2013 (BC Biomed). Data from LifeLabs suggests resistance to TMP-SMX has stabilized and is currently at 23.43% in the Mainland and 20.40% on the Island. A decreasing trend in nitrofurantoin resistance was observed over the years and remains low at 2.5% in 2013 ($p<0.01$, BCBiomed); however data provided by LifeLabs shows that resistance has stabilized at around 2.0% in the Mainland and 1.9% on the Island.
- From 2007 to 2013, *Streptococcus pneumoniae* isolates have demonstrated a stable rate of resistance to most tested antibacterial agents. In 2013, *S. pneumoniae* isolates tested non-susceptible against erythromycin, penicillin and TMP-SMX at rates of 26.2%, 11.6%, and 20.2% respectively (BC Biomed). An increase in resistant isolates to erythromycin, TMP-SMX, and

tetracycline on the Island was observed from 2008 to 2012 followed by a decrease in 2013 to 11.5%, 3.6%, and 6.0%, respectively (LifeLabs-Island).

- *Streptococcus pyogenes* isolates remain highly susceptible to amoxicillin-clavulanate, penicillin and cephalothin. Resistance rates of *S. pyogenes* to erythromycin and clindamycin have decreased significantly to 18% for each drug (BC Biomed). Similar trends were observed in data provided by LifeLabs on the Mainland.
- *Enterococcus spp.* isolates remain highly susceptible to ampicillin (97%) and nitrofurantoin (99%) in data obtained from both BC Biomed and Lifelabs. Isolates identified as vancomycin-resistant *Enterococci* (VRE) increased to 1.5% since 2007 ($p<0.001$, BC Biomed). Resistance to ciprofloxacin has slightly decreased to 23.8 % in 2013 (BC Biomed) with similar trends observed in data provided by Lifelabs.
- Resistance of *Klebsiella pneumoniae* isolates to ciprofloxacin, amikacin, and gentamycin remain low at 4.1%, 0.2%, and 1.6% respectively in 2013. In addition, the resistance to TMP-SMX shows a slight decreasing trend from 10.8% in 2007 to 7.8% in 2013 ($p<0.01$, BC Biomed).
- *Proteus mirabilis* isolates demonstrated a stable rate of resistance to ciprofloxacin since 2007/08 and are currently at 19.8% (BC Biomed) and 12.75% (LifeLabs- Mainland). In addition, a moderate level of resistance (30.2%) to TMP-SMX and a low level of resistance to gentamicin (6.2%) and amikacin (1.6%) in 2013 were observed (BC Biomed). Resistance to gentamicin among *P. mirabilis* isolates is substantially higher in the Mainland at 27.74% in 2013.
- The percent of *Haemophilus influenza* isolates showing resistance to ampicillin fluctuates between 15% and 27% since 2005 and was 19.7% (BC Biomed), 24.22% (Lifelabs-Island), and 23.16% (Lifelabs- Mainland) in 2013.

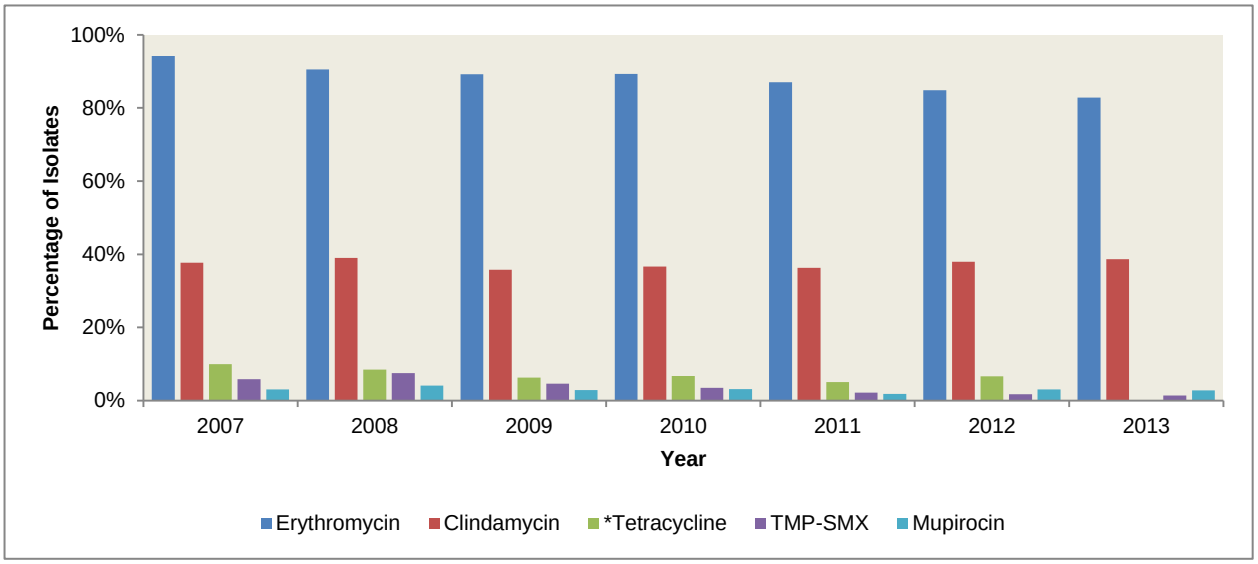

Figure 13. Resistance to erythromycin, clindamycin, tetracycline, trimethorpim-sulfamethoxazole (TMP-SMX), and mupirocin among community methicillin-resistant *Staphylococcus aureus* (MRSA) isolates in BC, 2007-2013

Source: BC Biomedical Laboratories

* 2013 data unavailable due to changes in methodology for susceptibility testing.

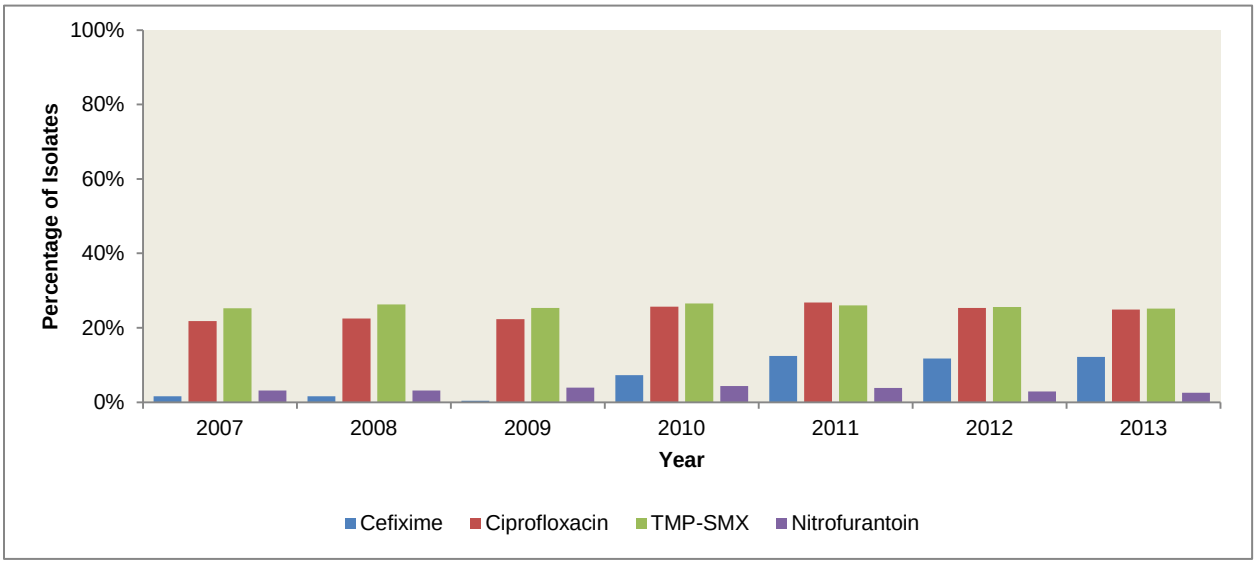

Figure 14. Resistance to cefixime, ciprofloxacin, trimethoprim-sulfamethoxazole (TMP-SMX) and nitrofurantoin among community *Escherichia coli* isolates in BC, 2007-2013

Source: BC Biomedical Laboratories

Conclusions

After nine 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. The distribution of materials has been extensive, and alternative approaches of reaching target audiences with the three key messages are being explored and implemented..

In addition to the documented progress in process evaluation indicators, the DBND program has shown excellent progress in outcome evaluation indicators.

DBND, in its ninth year of implementation, is showing positive achievements in addressing antibiotic resistance. The newly established collaboration with a large community provider 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.

Outcome evaluation has also demonstrated positive changes for health care professional knowledge and attitude. A continued decrease in overall antibiotic use has been observed since 2005, especially among prescriptions in the paediatric population. However, higher levels of antibiotic use have been observed among the elderly. Indication-specific analyses are integral to outcome evaluation and will be presented once the data becomes available.

During this past fiscal year, an online, community survey was conducted to measure changes in knowledge, attitudes, and behaviours associated with antibiotic use. The results demonstrated high levels of knowledge and awareness of the DBND program's key messages and associated behaviour among respondents. Continued efforts to reach a greater number of BC residents with clear messaging are needed.

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 stabilize trends in antibiotic resistance and reduce the impact on health.

Contributions and Acknowledgements

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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 as well as pharmacists from other pharmacy chain stores; students and instructors at the Vancouver Film School; child care resource and referral centre staff; healthcare workers caring for older adults; Dr. Anne Nguyen and Mr. Walton Pang for being strong advocates of the program; Lamar Transit Advertising; Alex Hill of Imagine Grafx; Hallamedia; 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 nine 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:

- BCIT (Burnaby)
- Camosun College (Victoria)
- College of the Rockies (Cranbrook)
- Langara College (Vancouver)
- North Island College (Courtenay)
- Okanagan College (Kelowna)
- Selkirk College (Castlegar)
- Trinity Western University (Langley)
- Vancouver Island University (Nanaimo)
- UBC (Vancouver)
- UBC Okanagan (Kelowna)
- UNBC (Prince George)
- University of the Fraser Valley (Chilliwack)
- University of Victoria
- College of New Caledonia (Prince George)
- Sprott Shaw Community College (various campus locations in BC)
- Thompson Rivers University (Williams Lake)

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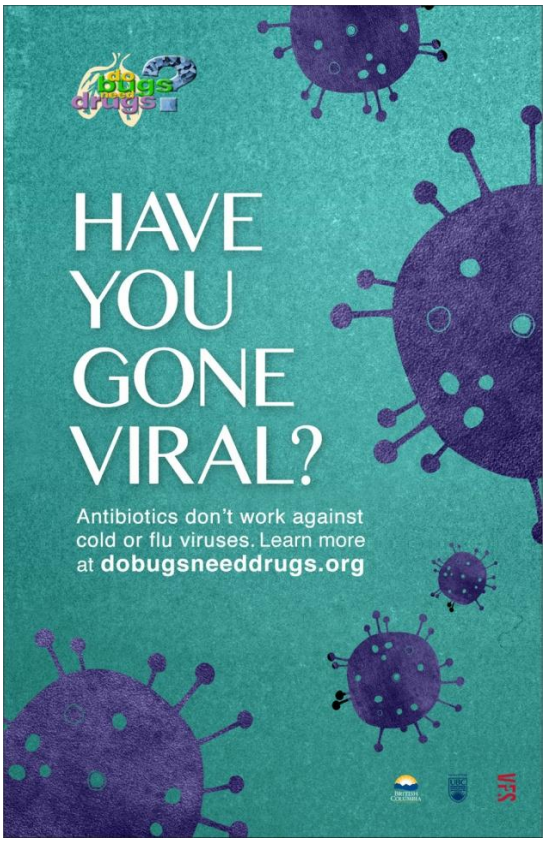
12 Blondel-Hill E, Fryters S. *Bugs and Drugs: An Antimicrobial/Infectious Disease Reference*. Edmonton: Alberta Health Services; 2012.

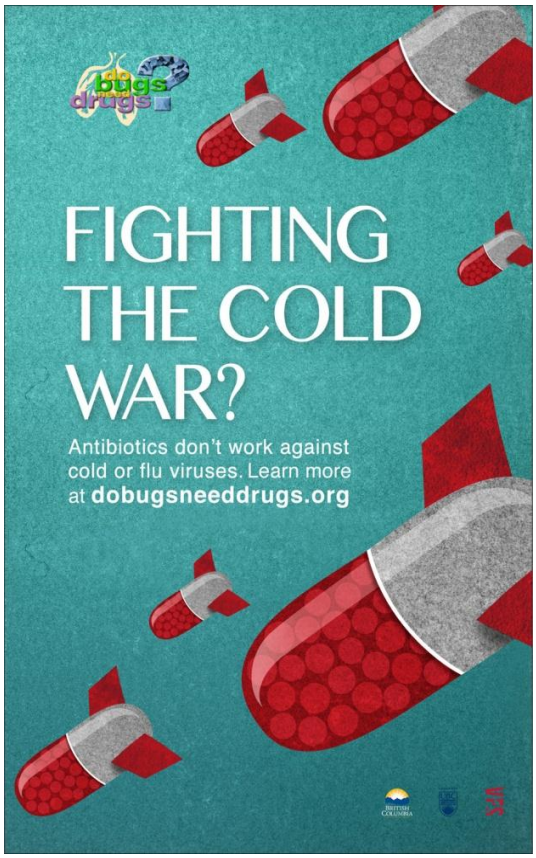
13 Ipsos Reid, BCCDC *Do Bugs Need Drugs?* Public Opinion Research Report, May 2014

Appendix

Transit Advertisements

Example 1. Platform posters at Skytrain Stations





Example 2. Skystrip Ads on Skytrains

Example 3. Ad on Side of Bus (King) and Interior Ad on Buses

Technical Notes

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 Hallamedia Inc. The figures are based on Broadcast Bureau of Measurement (BBM) audience data for the period of January 6 to February 23, 2014 for the Vancouver/Vancouver Island region and for one-week periods in February and March, 2013, for other regions except the Kootenays, which are no longer measured through BBM due to small sample sizes. Reported BBM audience numbers are likely underestimates, as percentages do not include public service announcement (PSA) time that may have occurred when the television advertisements ran over and above the negotiated contracts.

Transit ridership numbers were provided by Lamar Advertising. For the Canada Line, estimates are recorded using counters at each station for people entering and exiting. For the SkyTrain, these estimates are based on transit rider entry and exits from train stations or from individual ticket purchases at a train station plus an adjustment for monthly pass holders. For buses, estimates are calculated similarly to the SkyTrain by 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 represent underestimates of our true program reach, as compliance is likely less than 100%. In an effort to encourage compliance, individuals and facilities who had not maintained on-going contact, and had email or postal information available, were invited in May 2014 to order educational print material and provide information on programs taught recently in order to credit their contribution to the program.

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 systematic use for years 1996 to 2013. The PharmaNet database includes records of all outpatient prescriptions dispensed from community pharmacies to BC residents. 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 population per day, where DDD represents that average maintenance dose per day for a drug used in its main indication in adults.

Antimicrobial Resistance Data

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 were used to assess changes in trend over time.

Limitations

- Television and transit advertising numbers are estimates provided to the DBND program by external contractors and represent the estimated television viewer numbers and transit ridership numbers, respectively. However, the true uptake by our primary target audience group, women 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 we track where shipments are sent and the intended receipt type, 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 Laboratories 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 differ between the laboratories, each maintaining different antibiotics or implementing different cascading testing algorithms. 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.