SOUTH DAKOTA DEPARTMENT OF HEALTH

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Epidemiological Profile of Tuberculosis in South Dakota, 2016

By Kristin Rounds, Tuberculosis Control Coordinator, South Dakota Department of Health

During the last 10 years, South Dakota averaged 14 cases of tuberculosis (TB) per year. During 2016, there were 12 cases of TB reported to the South Dakota Department of Health. Figure 1 shows the 10-year trend of TB cases reported in South Dakota.

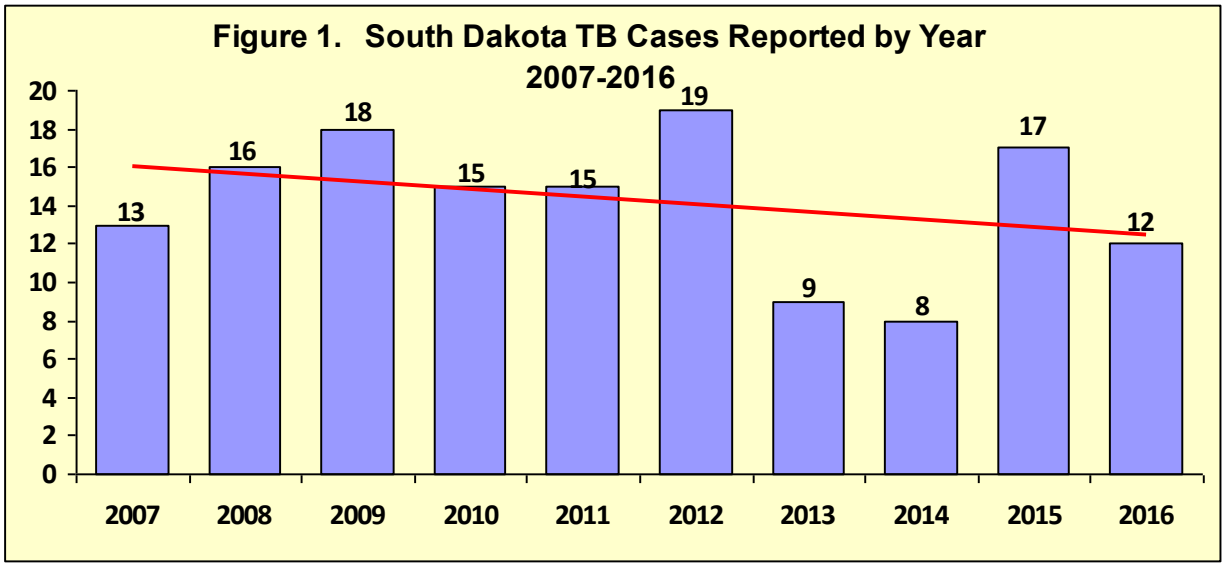

Figure 2 illustrates the 100-year history of tuberculosis cases in South Dakota. Since the 1950's there has been a dramatic decrease of cases due to the development of anti-tuberculosis medications. Case reductions are also a result of mandatory reporting of suspected TB cases to the Department of Health, case management, new treatment regimens and comprehensive contact investigations to ensure those exposed receive prompt intervention efforts.

For more information visit http://doh.sd.gov/diseases/infectious/TB/ or contact the following staff:

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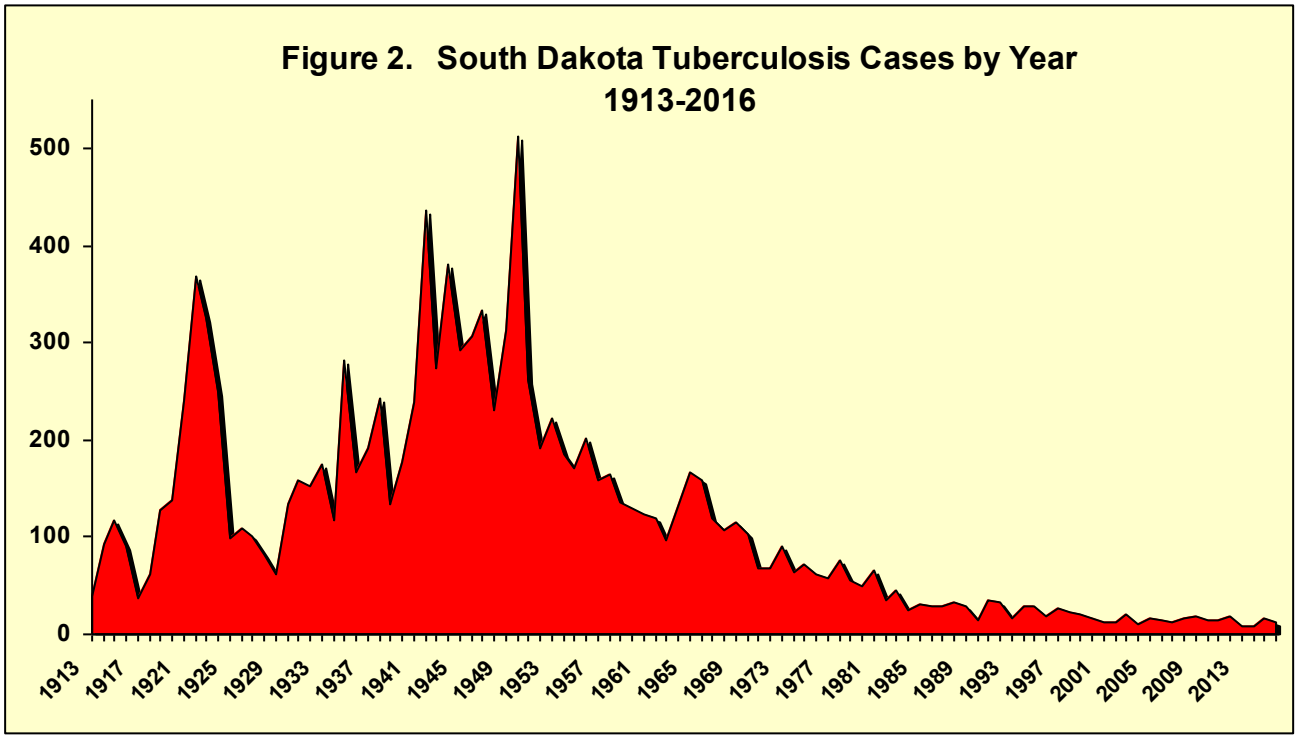


The most recent data available nationally and regionally is from calendar year 2015. Figure 3 provides a comparison of the TB case rate per 100,000 population for the United States as well as a regional comparison of South Dakota and our border states of North Dakota, Minnesota, Iowa, Nebraska, Wyoming and Montana.

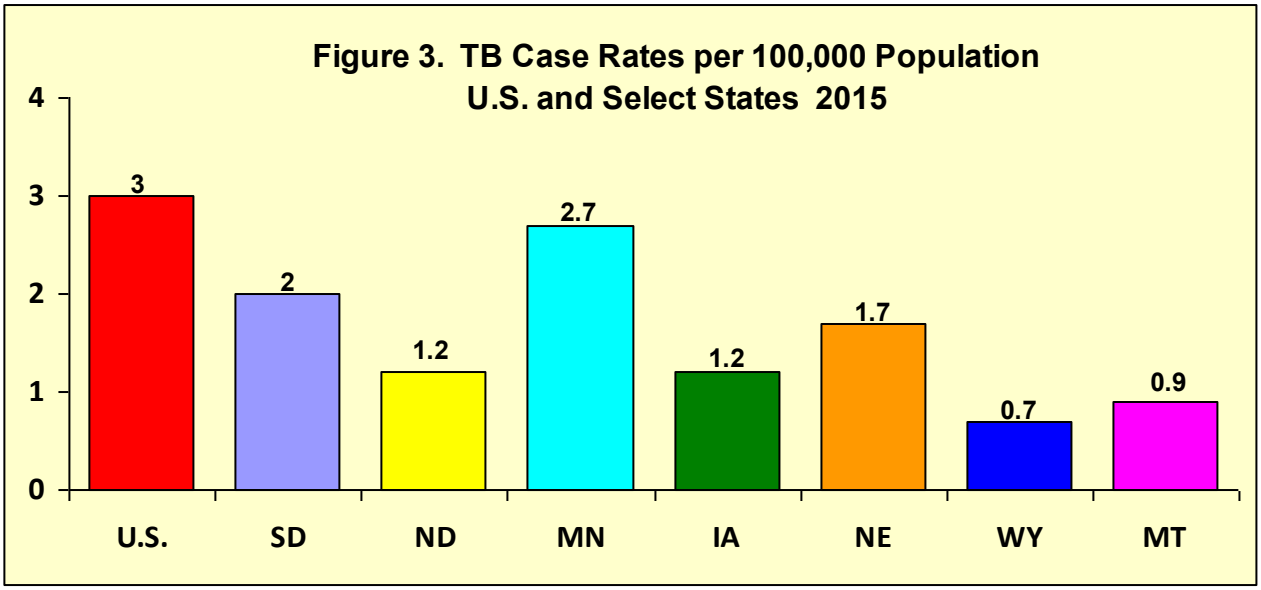
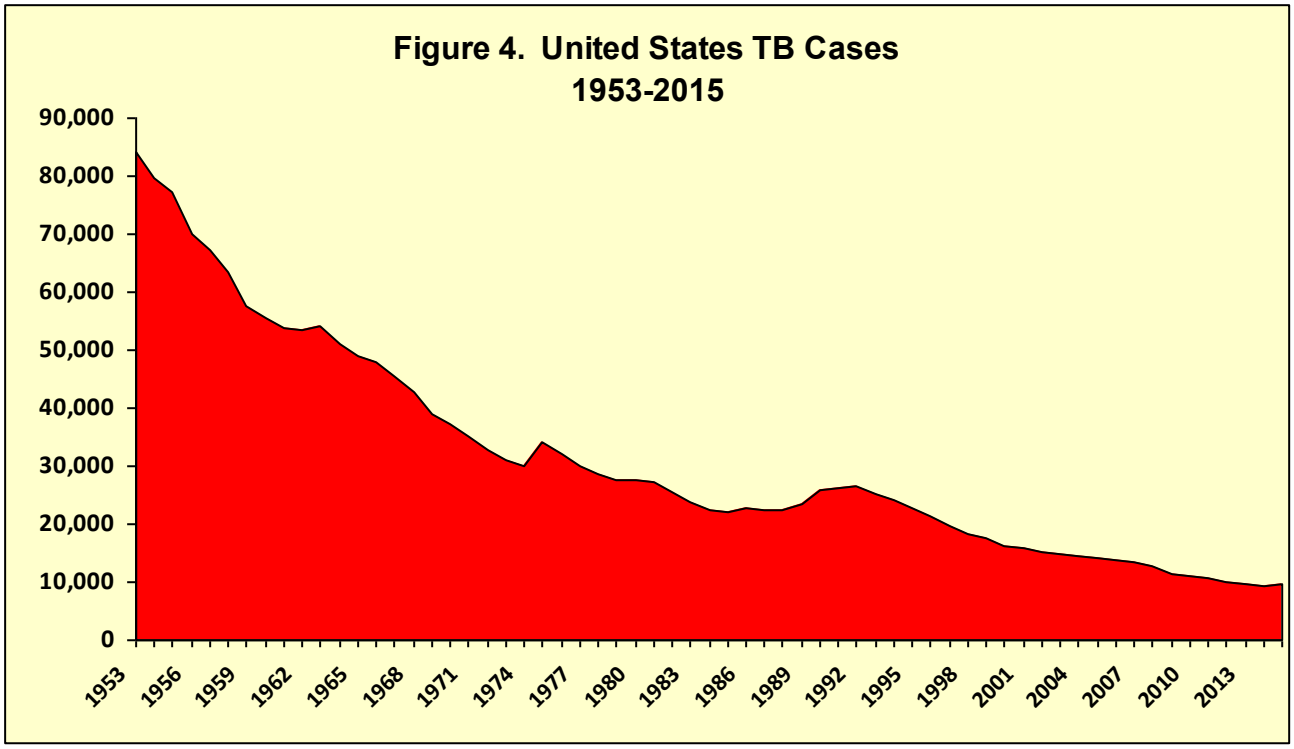


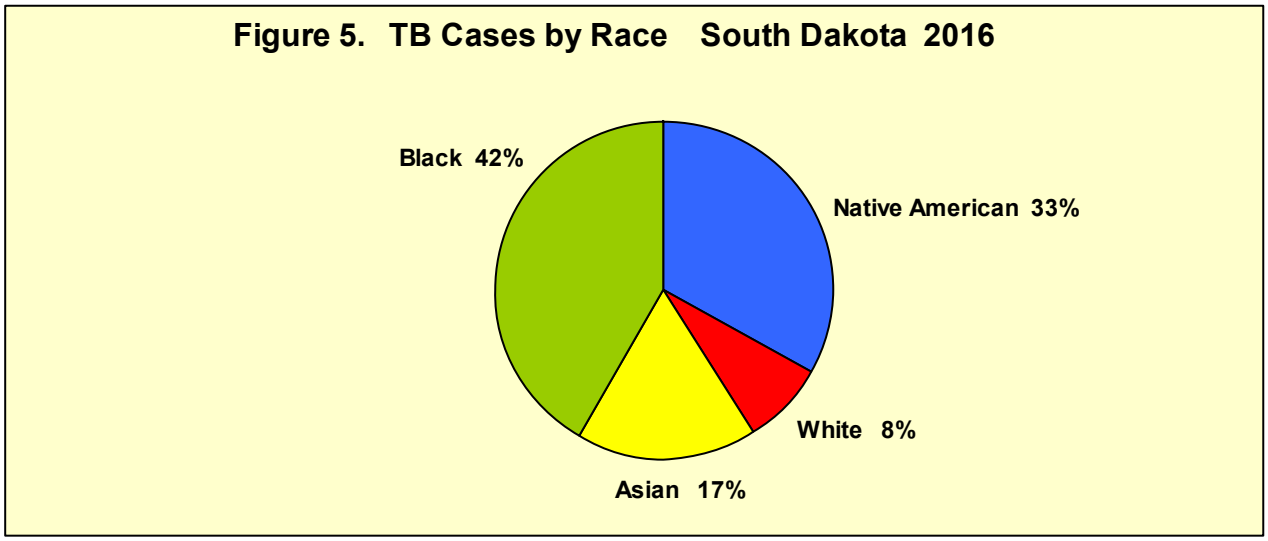
Figure 4 illustrates the historical trend of decreasing TB cases reported in the United States. In 2015 there were 9,557 TB cases reported in the US which is a 1.6% increase from 2014. During 2015, 27 states reported increased case counts from 2014. The 4 states of California, Texas, New York and Florida accounted for 51% of the national case total. During 2015, 1.1% of the reported cases had primary multi-drug resistance which is defined as resistance to the TB medications of at least isoniazid and rifampin. During 2015, 67% of TB cases nationally were in foreign-born persons, the highest percentage ever reported.



Native Americans have historically reported the highest percentage of TB cases by race. However in 2016 they accounted for only 33% of the total TB cases reported. Table 1 and Figure 5 provide information on TB cases by race in 2016.

Table 1. Tuberculosis Cases Reported by Sex and Race
South Dakota 2016

Race	Male	Female	Total	% of Cases
Native American	0	4	**4**	33%
White	1	0	**1**	8%
Black	5	0	**5**	42%
Asian	2	0	**2**	17%
Total	**8**	**4**	**12**	**100%**



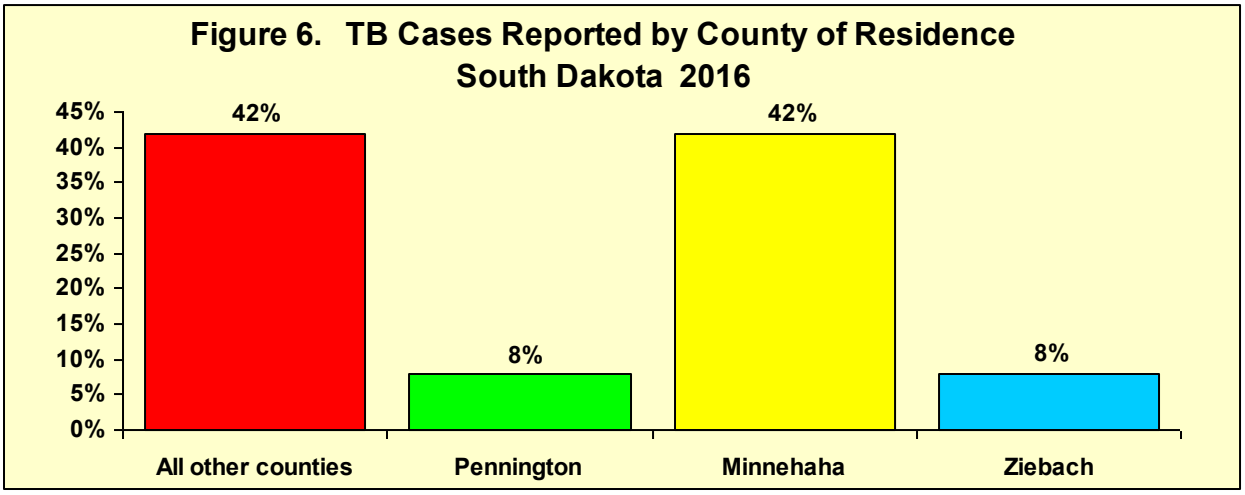
The TB incidence rate, which measures the number of TB cases per 100,000 population, is the best measure for determining the progress towards the elimination of TB in South Dakota. Historically, Native American TB case rates have dropped considerably while white cases have consistently remained low. The Black, Asian and other races mainly represent TB cases born outside of the United States who were diagnosed in South Dakota. Table 2 provides additional information on TB case rates for the last 6 years.

Table 2. Tuberculosis Morbidity Incidence Rates per 100,000 by Race & Year, South Dakota, 2011-2016

Race	2011	2012	2013	2014	2015	2016
US Case Rate *(All Races)*	3.4	3.2	3.0	3.0	2.9	Not available*
SD All Races	1.8	2.3	1.1	1.0	2.1	1.5
SD Native American	6.1	9.7	6.1	3.7	13.4	4.9
SD White	0.7	0.9	0.1	0.4	0.4	0.1
SD Black	13.6	20.4	13.6	13.6	13.6	34
SD Asian	39.4	26.3	13.1	0.0	13.1	26.3
All Other SD Races	0	0	0	0	0	0

**2016 US case rate data is not yet available.*

The South Dakota TB elimination goal is to reduce tuberculosis cases to an incidence of no more than 3.5 cases per 100,000 by the year 2020. In addition there is a special population target goal of reducing Native American tuberculosis cases to less than 15 cases per 100,000 by 2020. As referenced in Table 2, both of these objectives were accomplished in 2016.

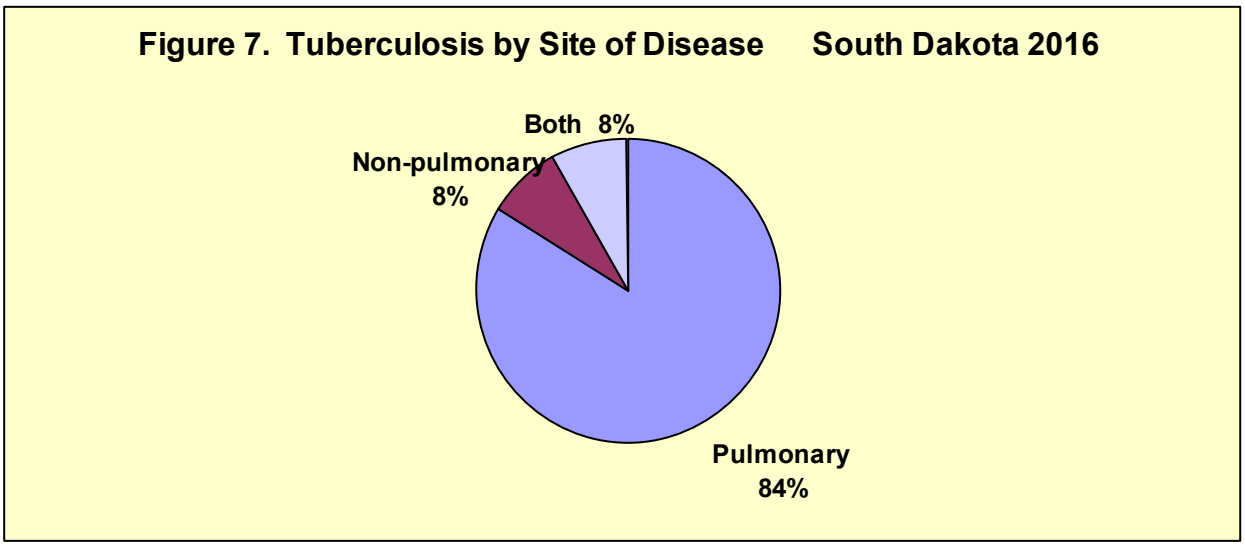


Tuberculosis cases in South Dakota have historically been located in a few geographic locations that consistently report the majority of TB cases. These include Minnehaha County which reports the highest number of foreign-born TB cases and Oglala Lakota (previously Shannon County), Todd and Pennington counties which report the highest number of Native American TB cases. Figure 6 and Table 3 provide additional information on the counties of residence of the TB cases in 2016.

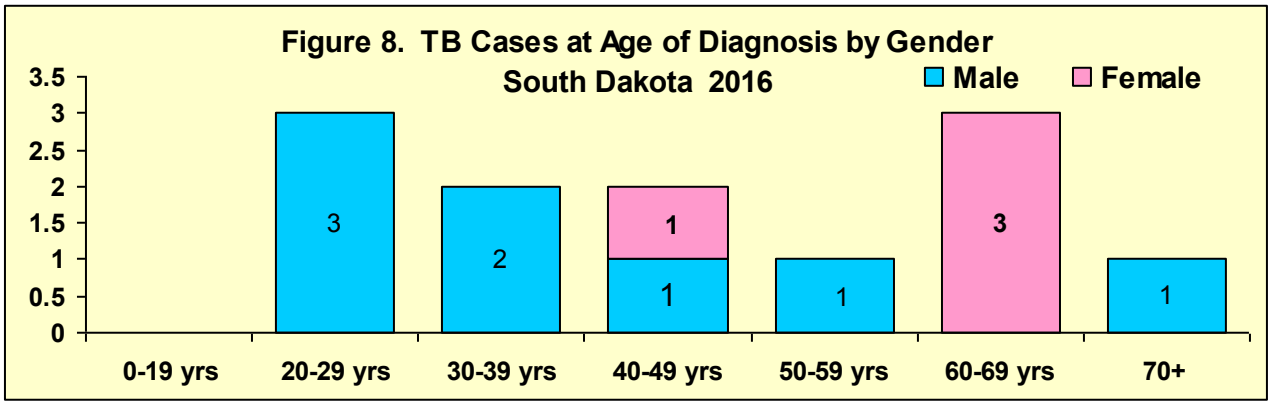
Table 3. TB Cases Reported by County of Residence
South Dakota 2016

County	# of TB Cases	County	# of TB Cases
Brookings	1	Pennington	1
Codington	1	Roberts	1
Charles Mix	1	Union	1
Minnehaha	5	Ziebach	1

Tuberculosis remains primarily a pulmonary disease with approximately 85% of cases nationally reported as pulmonary disease and 15% as non-pulmonary disease. South Dakota has historically reported a higher percentage of non-pulmonary TB disease; however, in 2016 South Dakota followed very closely with the national trend as described in Figure 7. The non-pulmonary sites of disease in 2016 included TB reported in the CSF, knee fluid and lung tissue.

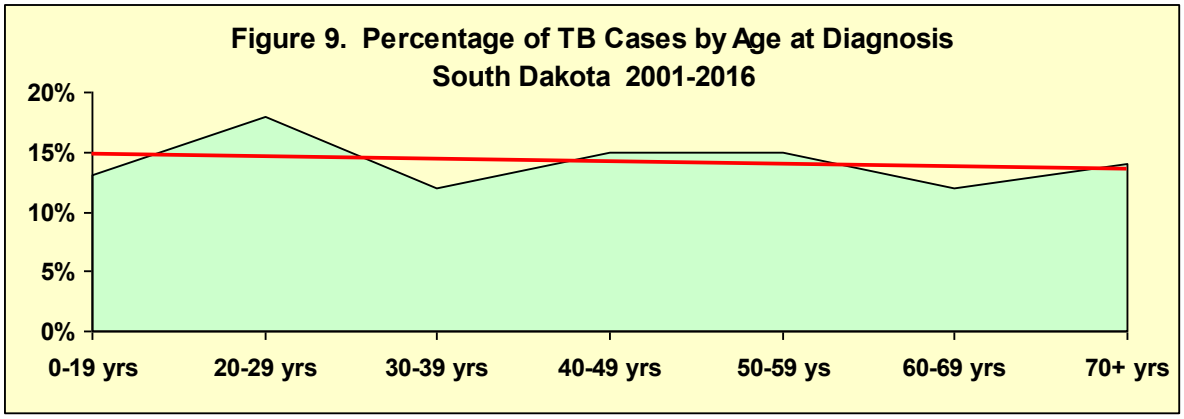


The average age of a TB case in 2016 was 46 years of age. This is an increase in age as compared to 2015 when the average age was 40 years of age. There were no children less than 10 years of age reported during this time period. Figure 8 illustrates the age at diagnosis by gender for tuberculosis cases reported in 2016.

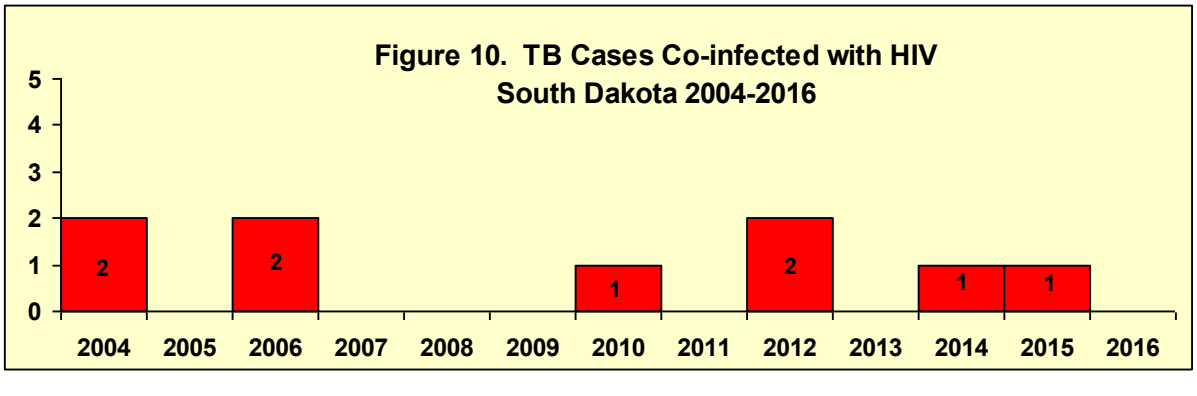


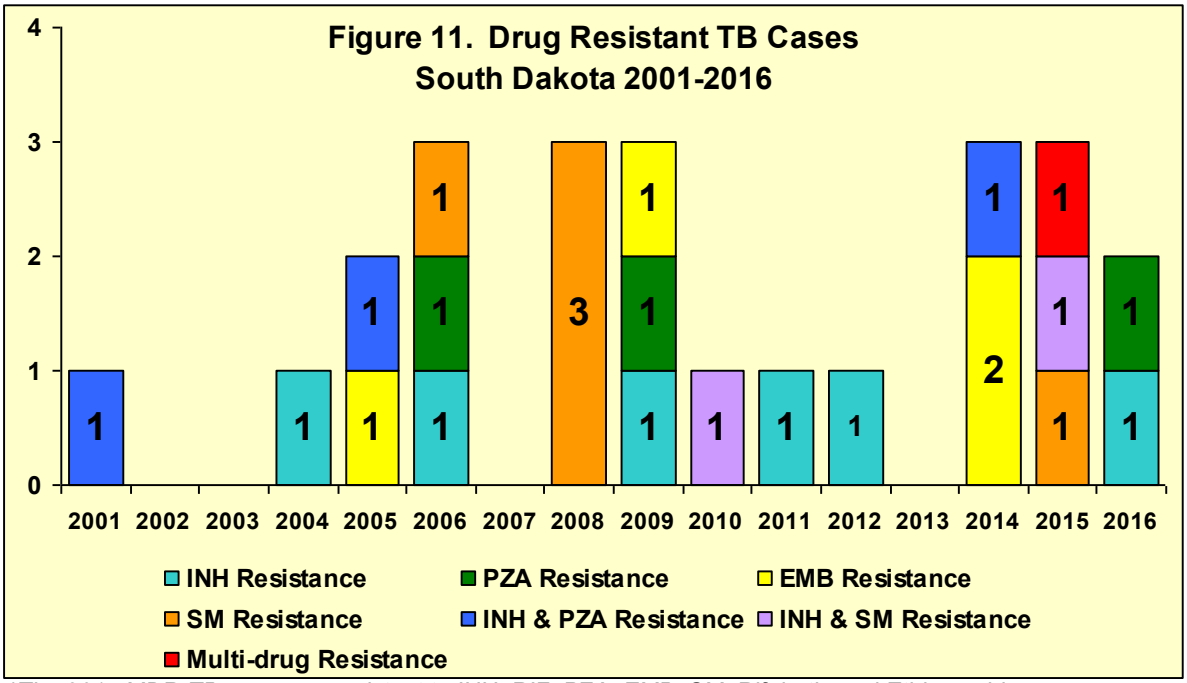
Historically most tuberculosis cases are diagnosed as adults in South Dakota. Figure 9 shows the majority of TB cases diagnosed in South Dakota were 40 years of age or older at the time of diagnosis from 2001 through 2016.

Co-infection with HIV is an important risk factor for the development of active TB. Because of this, all TB cases diagnosed in South Dakota are offered HIV testing. Co-infected TB cases require more monitoring for toxicity and are frequently treated with second line TB medications. Figure 10 describes the number of TB cases co-infected with HIV since 2004 documenting that HIV co-infected TB cases remain uncommon.



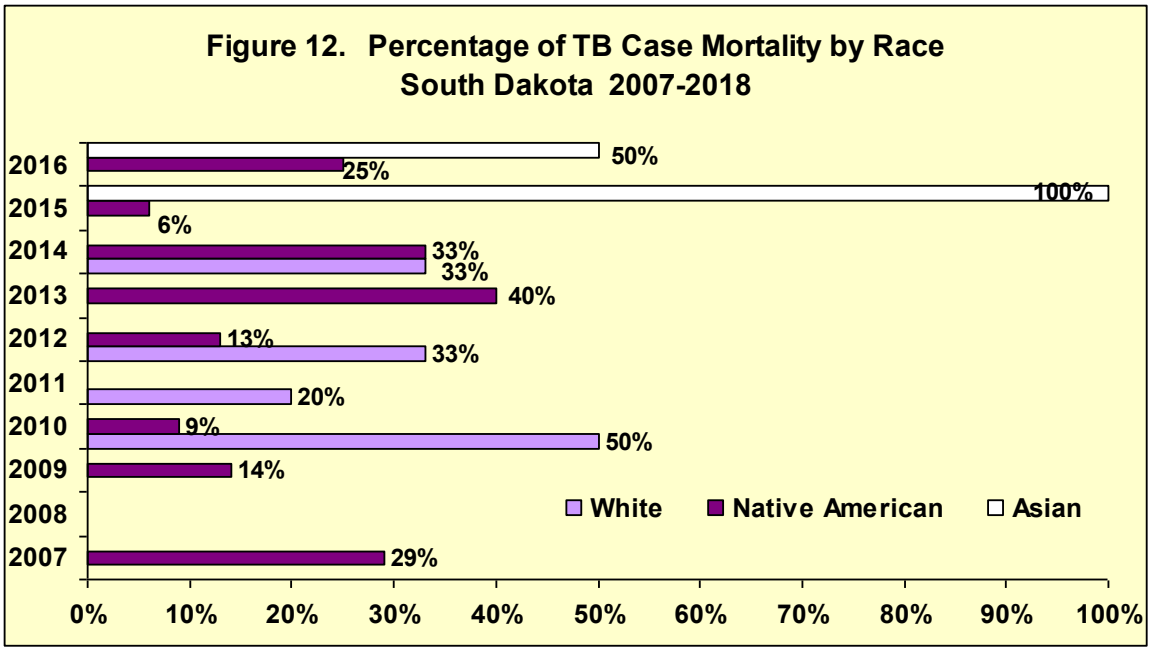
All culture positive TB isolates are tested for drug resistance to first-line TB medications including isoniazid (INH), rifampin (RIF), pyrazinamide (PZA), ethambutol (EMB) and streptomycin (SM). Multi-drug resistant TB is defined by CDC as resistance to at least INH and RIF and is a significant public health problem because of the difficulty in achieving a successful treatment outcome. Figure 11 shows drug resistant TB cases since 2000 illustrating that South Dakota most often has single drug resistant cases. South Dakota reported the first multi-drug resistant TB case in 2015.





**The 2015 MDR-TB case was resistant to INH, RIF, PZA, EMB, SM, Rifabutin and Ethionamide.*

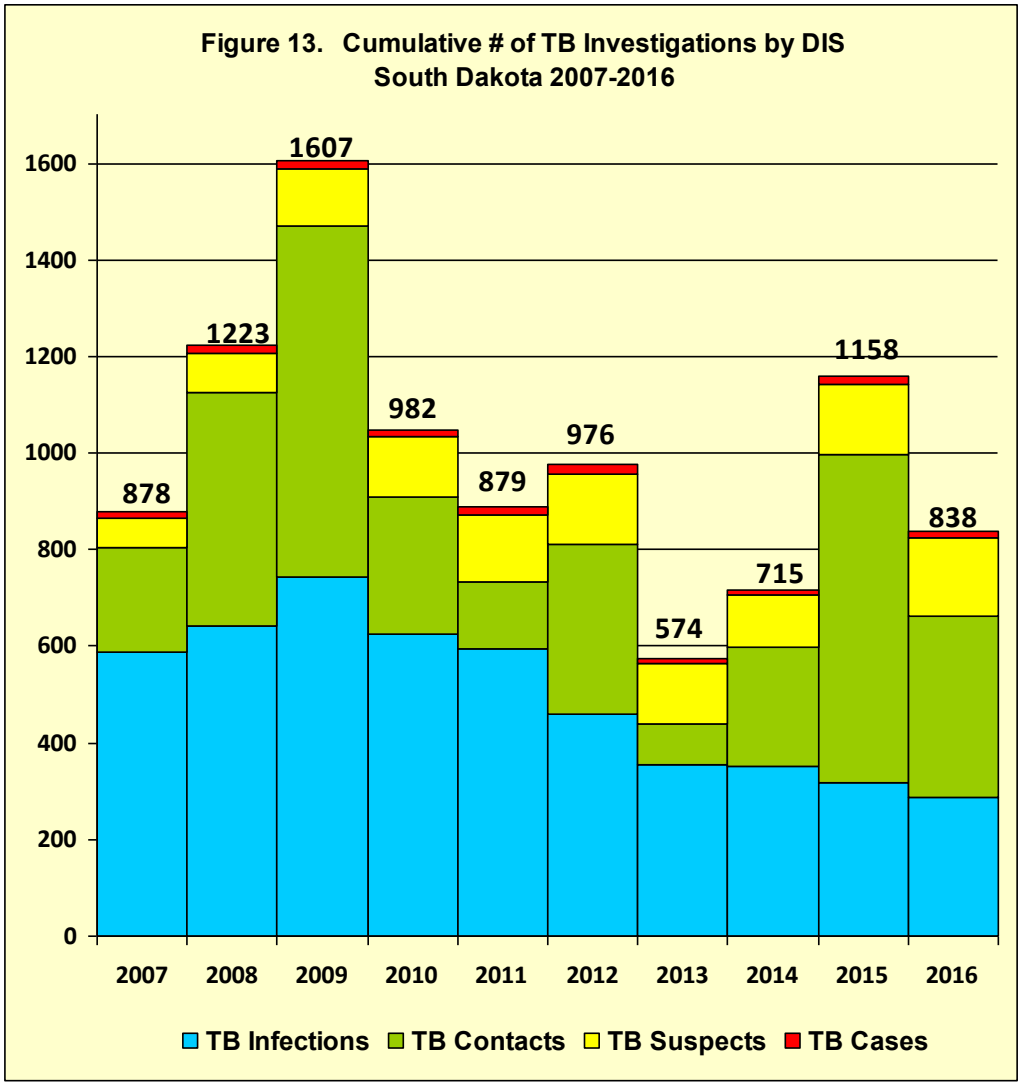
South Dakota has reported a high mortality rate during certain years, especially among Native American patients. Figure 12 shows the mortality rates by race since 2007 for all races.



The workload in the TB Control Program consists of four categories of patients:

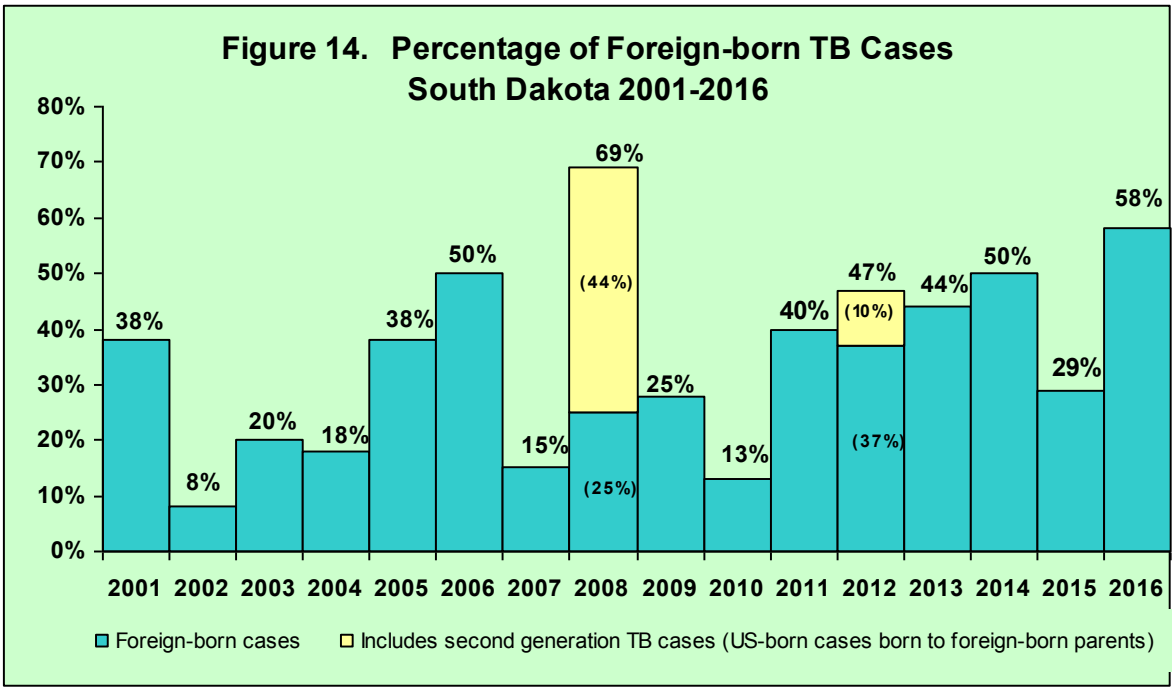
1) **TB cases** (persons diagnosed with active TB)
2) **TB suspects** (persons suspected of active TB with a pending diagnosis)
3) **TB contacts** (persons exposed to an infectious TB case)
4) **Latent TB infection** (persons reported with a positive TB skin test or positive IGRA test [interferon gamma release assay])

Disease Intervention Specialist (DIS) staff are responsible for ensuring appropriate investigation, treatment and follow-up of these individuals statewide. Figure 13 describes this cumulative caseload which is divided among 19 DIS staff illustrating that the active TB cases and suspect TB cases represent the smallest number of patients reported. TB contacts and patients with latent TB infection make up the greatest percentage of assigned workload for DIS staff within the TB Control Program.

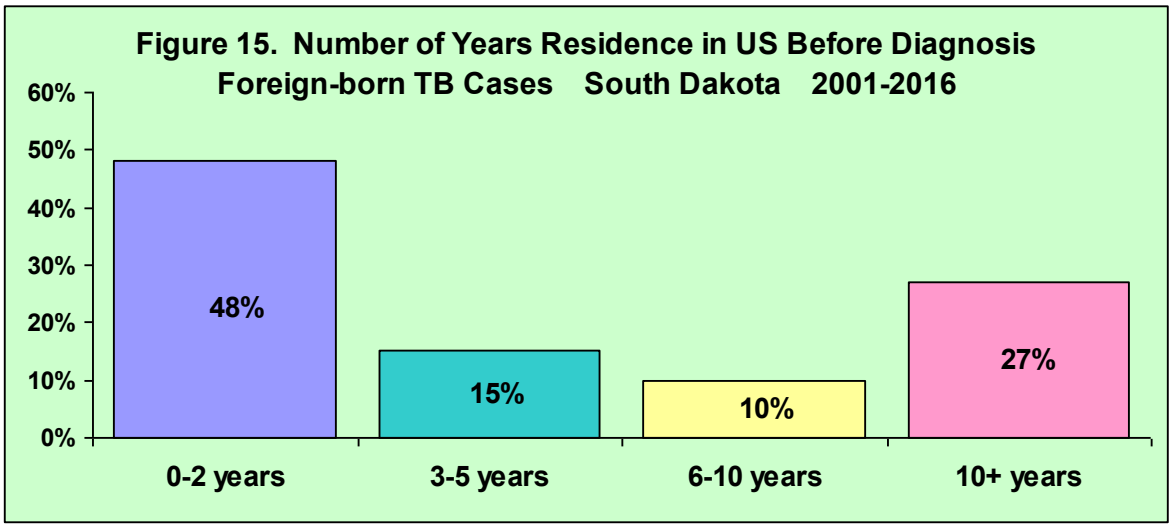


Analysis of Foreign-Born TB Cases in South Dakota

Tuberculosis cases who were born outside the United States continue to represent an important risk group in the United States as well as in South Dakota. Figure 14 describes the percentage of foreign-born TB cases in South Dakota. Second generation TB cases (US-born TB cases born to foreign-born parents) are a relatively new risk group that has been identified nationally. TB cases were first reported in this group in South Dakota in 2008 and then again in 2012.

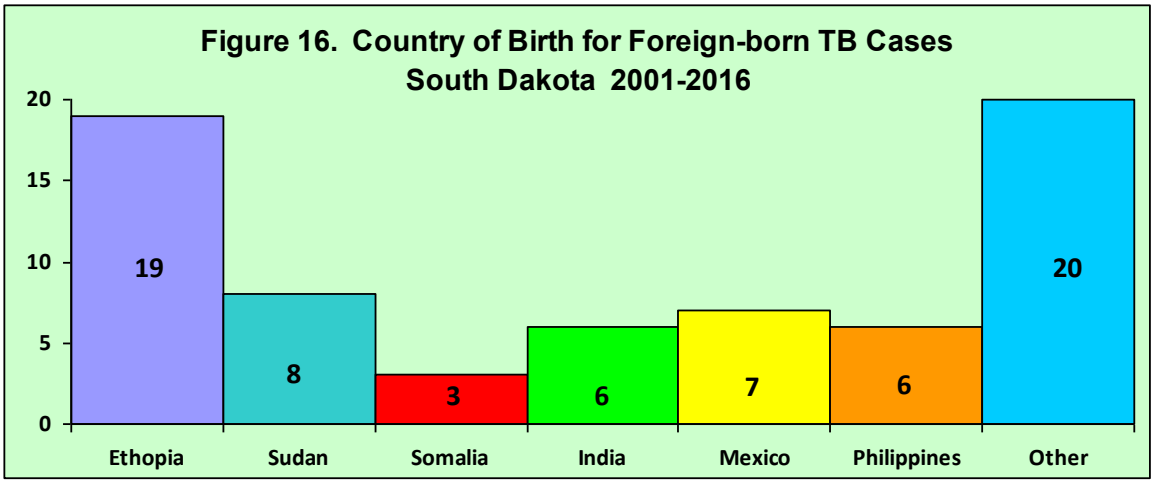


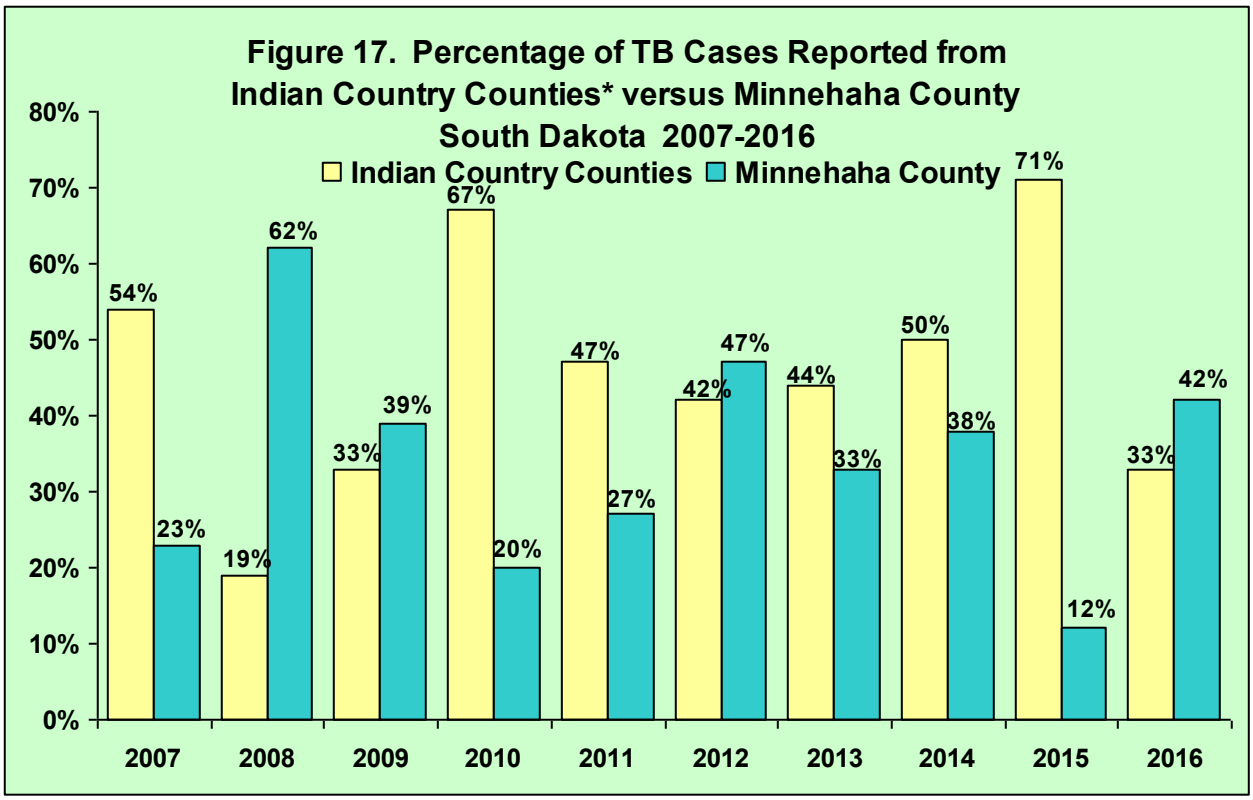
Most foreign-born persons who develop active TB usually do so within the first two years after arrival in the United States. Figure 15 describes that 63% of foreign-born TB cases since 2001 developed active TB within the first five years of their arrival. Because of this increased risk, these individuals are targeted for preventive TB program activities including targeted TB skin testing and preventive treatment programs.



Foreign-born TB cases continue to come from many areas of the world; however, the majority of the TB cases reported in South Dakota are of African descent. Figure 16 describes the country of birth for the foreign-born TB cases reported in South Dakota since 2001. Countries of birth for the "other" category include Afghanistan, Bangladesh, Bhutan, China, El Salvador, Honduras, Indonesia, Kenya, Laos, Liberia, Palau, Romania, Russia, Nepal, Mauritania, Vietnam, South Africa and South Korea.

Another factor in the increase of foreign-born TB cases in South Dakota is the change geographically where TB cases are reported. Historically, the highest percentage of TB cases have been reported from counties that included and bordered American Indian Reservations. However, in other years there has been a shift of TB cases reported from Minnehaha County as illustrated in Figure 17. This is due to the fact that most foreign-born persons who resettle in South Dakota do so in Minnehaha County.

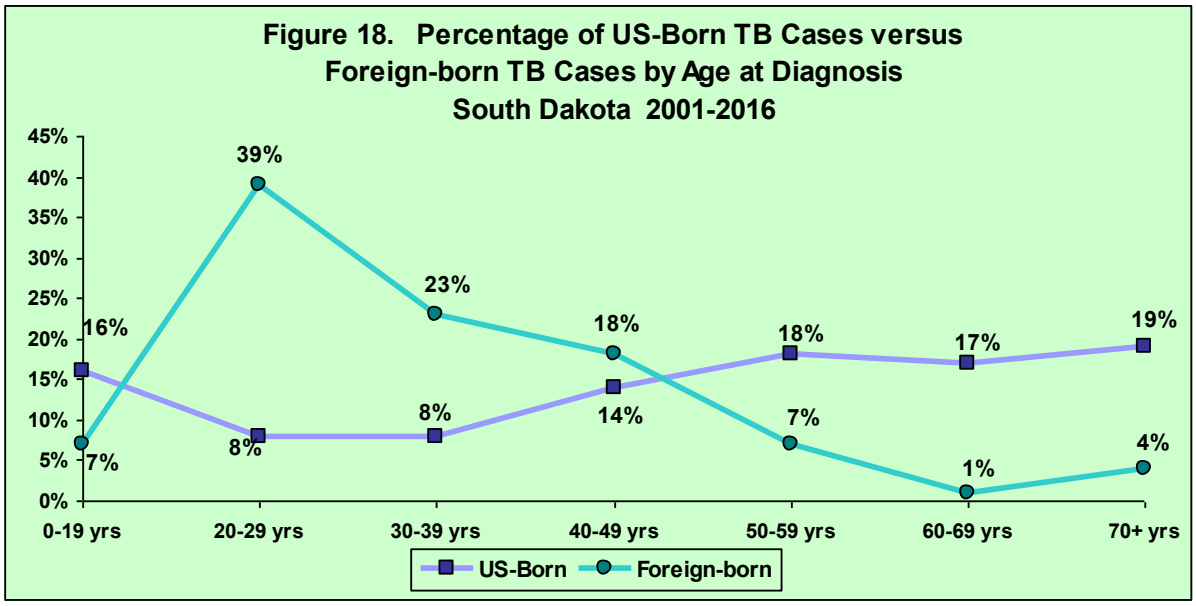


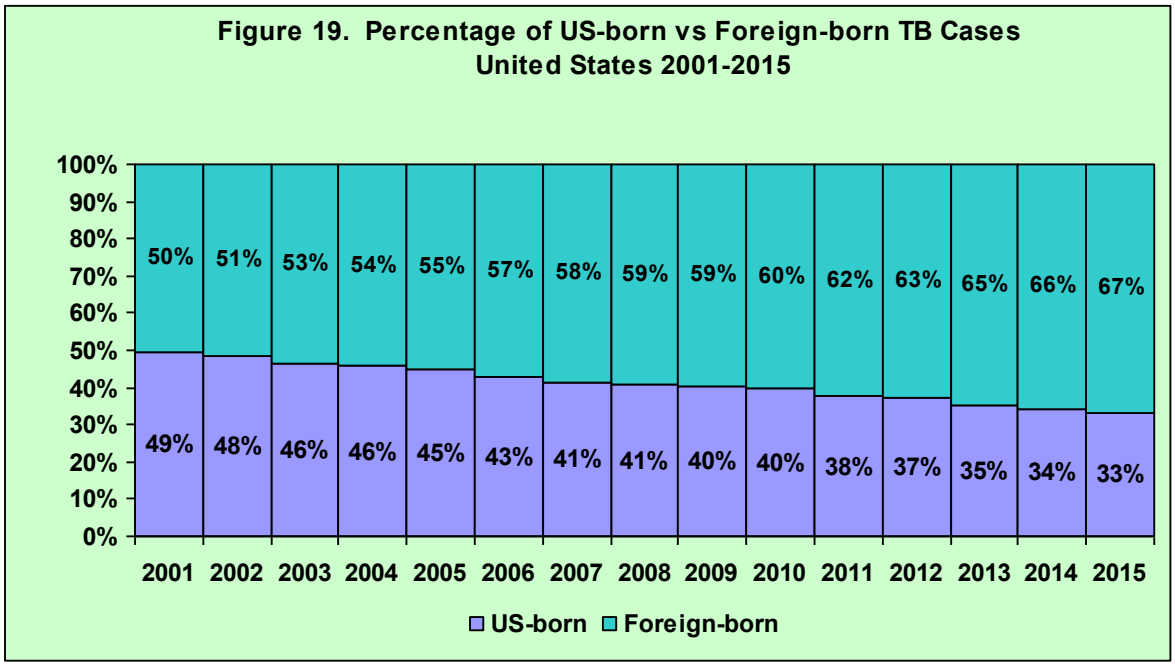


*Indian Country counties include Bennett, Brule, Buffalo, Charles Mix, Corson, Dewey, Jackson, Mellette, Moody, Pennington, Roberts, Oglala Lakota, Todd, Tripp, Walworth and Ziebach.

Foreign-born TB cases are consistently reported in younger persons as compared to U.S. born patients in South Dakota. This presents additional TB program management issues as these TB cases more commonly have young children who have been exposed at home and are typically employed requiring an investigation at their worksite which increases the number of contacts that must be screened and treated. Figure 18 illustrates that the majority of foreign-born TB cases are diagnosed while young adults.

Foreign-born TB cases represent a unique challenge to the South Dakota TB Control Program because of cultural issues, language barriers and a greater likelihood of drug resistance. As these cases continue to increase in South Dakota, additional time and resources will need to be dedicated to address these unique issues. Figure 19 describes the ever increasing trend of the percentage of foreign-born TB in the United States since 2001.



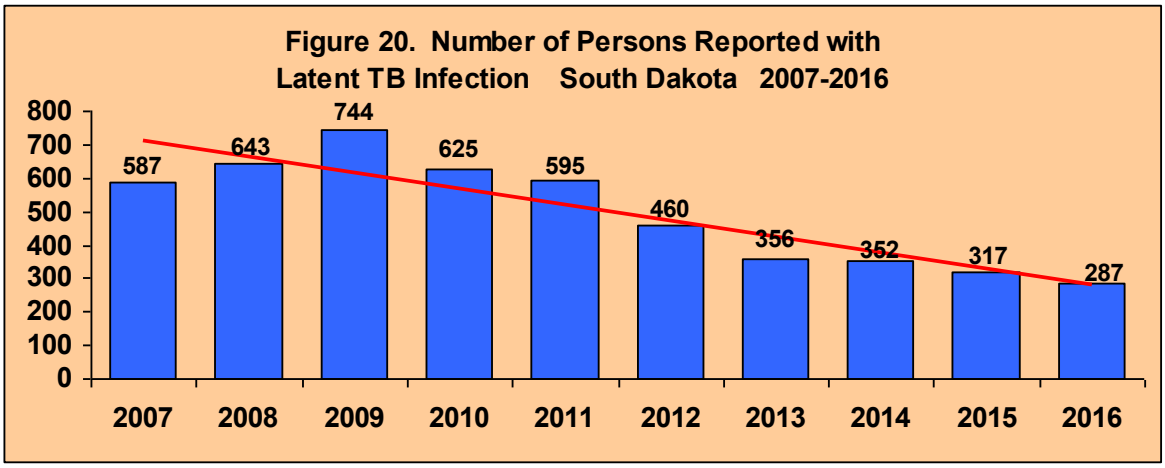


Latent TB Infection and Prevention Activities

Ensuring for appropriate treatment and follow-up of active TB cases and suspects is the highest priority of the Tuberculosis Control Program. However, in order to achieve TB elimination in South Dakota, an emphasis must be made on preventing future cases of TB. This is accomplished by follow-up of persons infected with latent TB infection. These individuals are infected with the TB bacteria (*Mycobacterium tuberculosis*) but have not yet developed an active form of the disease. By finding and treating these individuals, future TB cases can be prevented and therefore the TB Control Program dedicates time and resources to this preventive strategy.

Figure 20 presents the number of patients reported with latent TB infection (positive TB skin tests or positive IGRA testing) over the last 10 years. All of these individuals have the potential to develop active TB disease and potentially be infectious to others.

On August 2, 2011, the South Dakota Department of Health implemented an administrative rule change which changed the reporting requirement for latent TB infection. Prior to that, all persons diagnosed with latent TB infection were reportable to the South Dakota Department of Health. As of August 2, 2011, only patients with latent TB infection who have at least one of the following TB risk factors are now reportable:



REPORTABLE TB RISK FACTORS

- Foreign-born persons who entered the US within the last 5 years
- Persons evaluated for tumor necrosis factor-alpha therapy
- Immunosuppressive therapies (i.e. high dose steroids)
- Radiographic evidence of prior TB
- Children less than 5 years of age
- Close contact to infectious TB
- HIV infection
- Diabetes
- Renal dialysis
- Silicosis
- Organ transplant
- Head and neck cancers
- Leukemia
- Hodgkin's disease

This reporting change allows the Department of Health to focus staff time, medication and resources towards those patients who have the highest risk of developing active tuberculosis. Due to this change, only the above patients will be eligible for Department of Health nurse case management and medication. Health care providers and facilities are asked to report only patients with LTBI who meet this new reporting requirement by mailing or faxing the *"Latent Tuberculosis infection Report Form"* to the TB Control Program (reporting instructions are on the form). The form is available on the South Dakota Department of Health website: http://doh.sd.gov/diseases/infectious/TB. Patients who do not meet this reporting criteria should be referred to their private health care provider for evaluation and treatment at their own expense. All patients currently being managed by Department of Health staff will be allowed to finish their prescribed course of treatment regardless of their risk factor status.

Figure 21 presents the number of patients with latent TB infection that started a course of preventive treatment as well as the number who completed this treatment. The treatment is usually done with Isoniazid (INH) which is provided free of charge to patients by the TB Control Program.

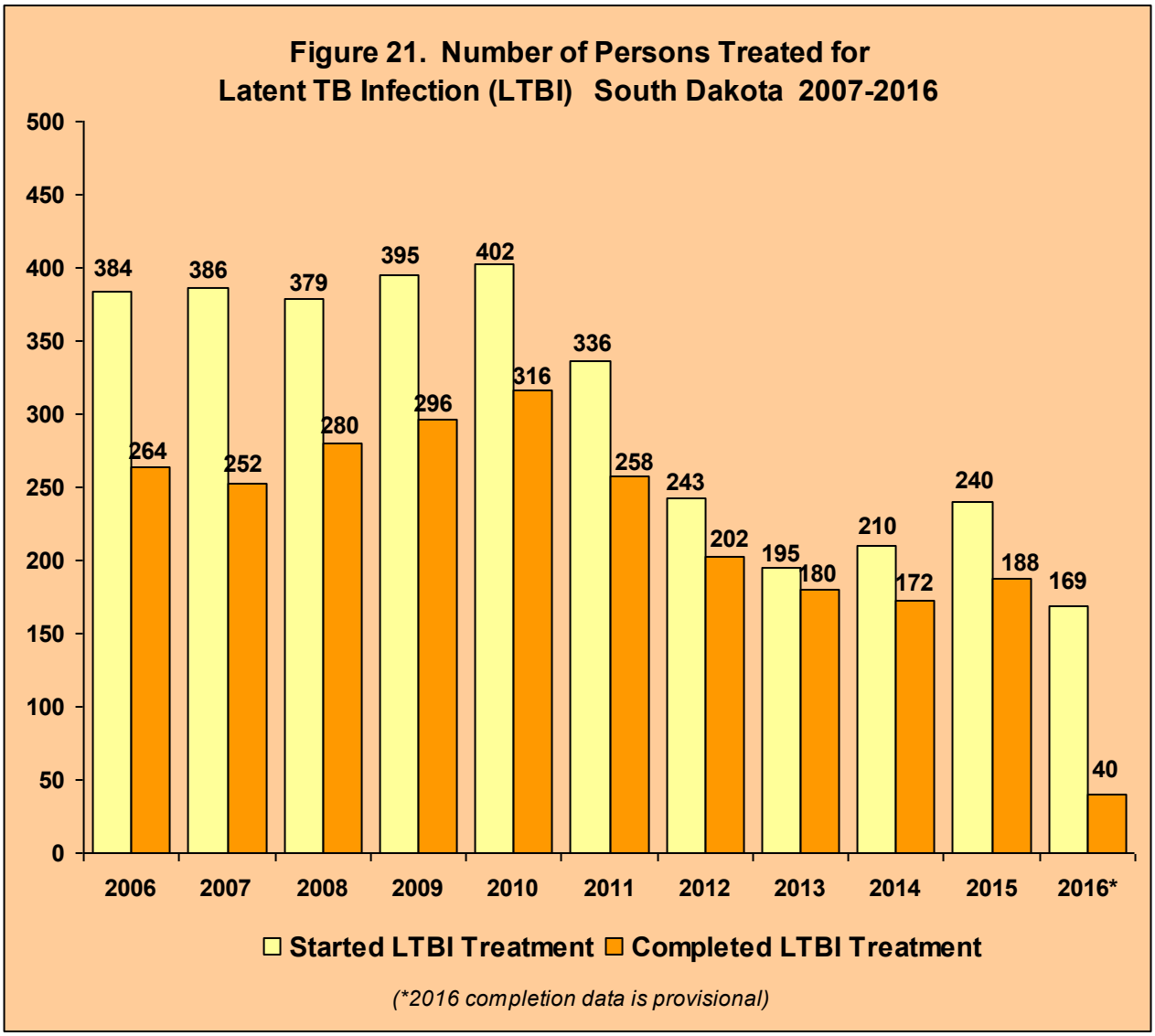
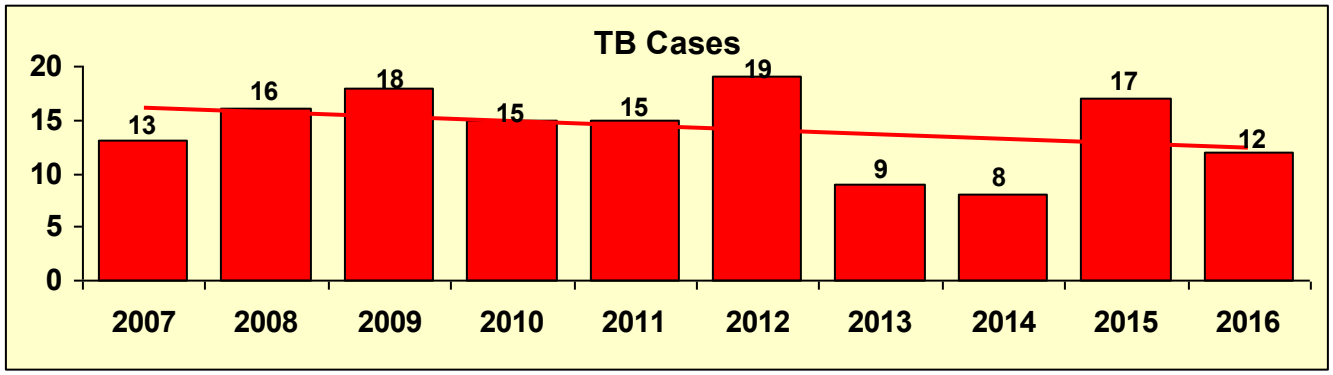
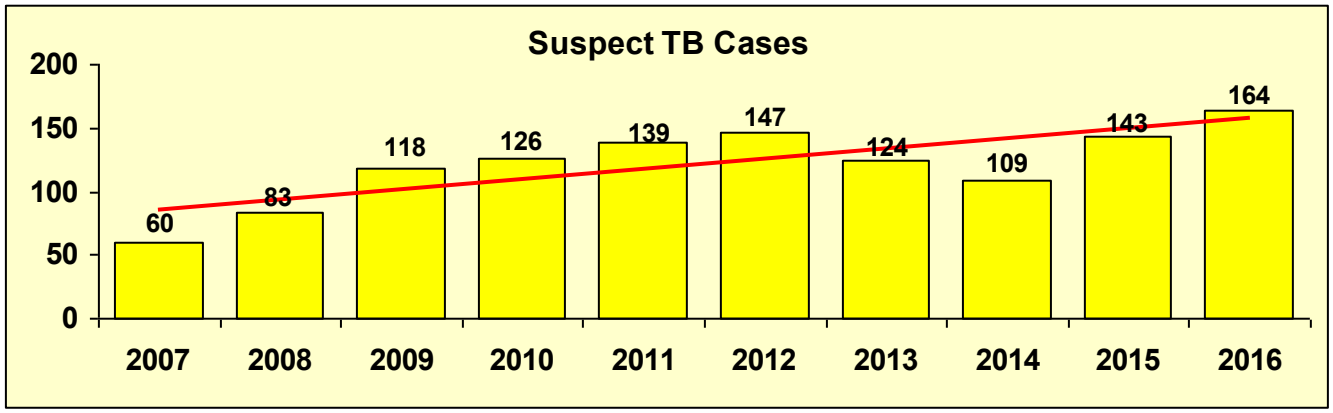
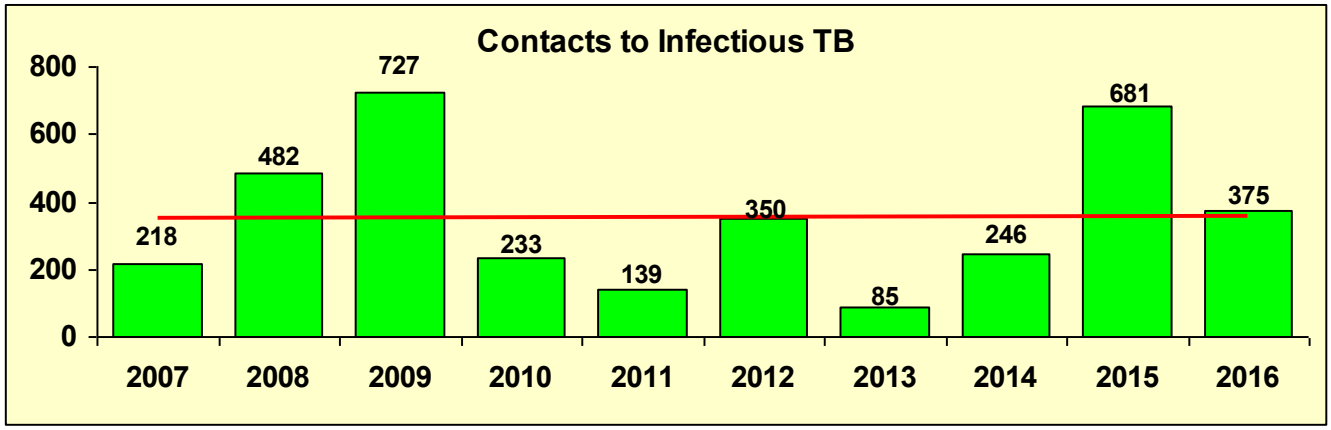


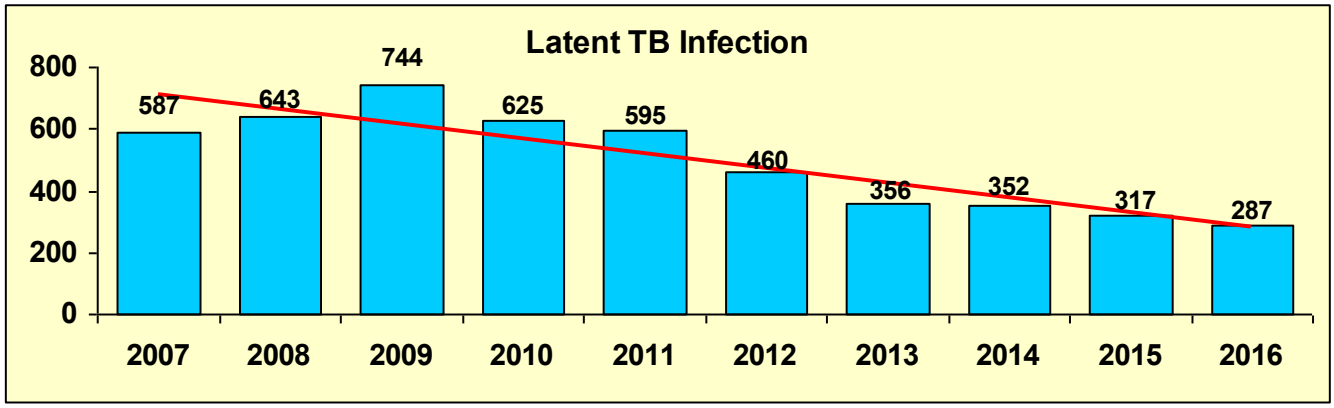
Figure 21. Number of Persons Treated for
Latent TB Infection (LTBI) South Dakota 2007-2016
500
450
400
350
300
250
200
150
100
50
0
384
264
386
252
379
280
395
296
402
316
336
258
243
202
195
180
210
172
240
188
169
40
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016*
Started LTBI Treatment
Completed LTBI Treatment
(*2016 completion data is provisional)

Summary of TB Control Program Caseload, South Dakota 2007-2016









How South Dakota Reduced CRE through a Multi Disciplinary Approach

(NOTE: The following first appeared in the national Public Health Foundation Pulse blog. It was drafted by Angela M. Jackley, RN, Healthcare-Associated Infections and Antimicrobial Resistance Program Coordinator for the South Dakota Department of Health. The original blog can be found at www.phf.org/phfpulse/Pages/How_South_Dakota_Reduced_CRE_through_a_Multi_Disciplinary_Approach.aspx.)

In December of 2012, South Dakota experienced an outbreak of Carbapenem-resistant Enterobacteriaceae (CRE). An astute infection preventionist alerted us to over a dozen cases of carbapenem resistance over a six month period. As a result, the South Dakota Department of Health (SDDOH), http://doh.sd.gov/, aligned with statewide healthcare facilities to address the outbreak. Our agency hosted experts from the Centers for Disease Control and Prevention to discuss CRE epidemiology and prevention and antimicrobial stewardship with physicians, infection preventionists, and healthcare executives. Following the seminar, the South Dakota Secretary of Health personally invited multi-disciplinary stakeholders across South Dakota to prevent future drug-resistant outbreaks by improving prescribing practices.

South Dakota is a rural state with fewer than 900,000 people living across 77,000 square miles, requiring resourcefulness when problems arise. Often, the same leaders participate on issues ranging from Ebola preparation and response to H1N1 outbreaks and multi-drug resistance. This familiarity and collaboration provides us the opportunity to establish mutually beneficial associations which often includes providing resources, training, or technical support. These long-standing relationships afford us the opportunity to directly involve people with the ability to make decisions on behalf of a healthcare system.

In 2013 we formed an antimicrobial stewardship workgroup (doh.sd.gov/diseases/hai/Stewardship-workgroup.aspx) that includes members from South Dakota's Quality Improvement Organization, hospital association, long-term care association, Indian Health Service, and the Board of Pharmacy, along with individual pharmacists, microbiologists, infection preventionists, and healthcare system infectious disease physicians. Gathering the right people to partner with us proved effortless; however, we faced immediate challenges in 2013 when our coalition did not receive programmatic funding for stewardship. The SDDOH experienced difficulties hosting meetings without funding and relied upon volunteer efforts.

Healthcare systems alleviated a share of the burden and hosted meetings when we in the SDDOH were unable. During the meetings, the workgroup identified the need to structure the group's activities according to the Core Competencies for Public Health Professionals, (www.phf.org/resourcestools/Pages/Core_Public_Health_Competencies.aspx)specifically focusing on policy development. Each statewide partner assessed their roles and responsibilities. Our workgroup established a plan in year one to implement or expand stewardship activities in the flagship hospitals, followed by expansion into critical access hospitals and clinics over the following 24 months. We asked hospitals without formal programs to review their internal data and determine the right measures to implement stewardship activities utilizing existing tools, including the Antibiotic Stewardship Driver Diagram and Change Package. (www.cdc.gov/getsmart/healthcare/pdfs/Antibiotic_Stewardship_Change_Package_10_30_12.pdf). Competing healthcare systems assisted one another and shared existing practices, protocols, and formularies.

SDDOH appealed to organizations asking them to sponsor antimicrobial stewardship education during their annual meetings. We produced statewide and regional antibiograms (doh.sd.gov/diseases/hai/2015antibiogram.aspx) to serve as a baseline for future efforts to improve the susceptibility of important healthcare-associated pathogens. We created an inter-facility transfer form (doh.sd.gov/documents/diseases/HAI/InterfacilityTransfer.pdf) and streamlined CRE screening criteria (http://doh.sd.gov/documents/diseases/HAI/CRE_screening_criteria.pdf) for patients upon admission to hospitals.

The last several years have yielded numerous accomplishments including a 50% reduction in CRE within the first year, conducting train-the-trainer programs, adding CRE as a reportable condition, and sharing data on drug-resistant organisms. Achievements beyond CRE include a hospital systems expansion of stewardship into 21 critical access hospitals, daily telemedicine rounds offered to clinics by infectious disease physicians, and a 40% reduction in prescribing fluoroquinolones, which contribute to antibiotic resistance. In addition, one sys-

tem implemented use of clinical decision support tools in 100% of their clinics. The workgroup authored pediatric upper respiratory guidelines (http://doh.sd.gov/diseases/hai/pediatricUrguidelines.aspx) and improved susceptibility patterns across the state.

The workgroup members provide educational offerings, support to hospitals starting stewardship programs, and subject matter expertise with goals to accomplish more. The new Centers for Medicare and Medicaid Services stewardship regulations provide an opportunity to expand stewardship into long-term care but require additional resources to implement activities. The workgroup combined resources with the hospital association and quality improvement network to address this barrier. The new projects, meant to expand stewardship into nursing homes, will concentrate on prescribing practices related to Clostridium difficile and asymptomatic bacteriuria.

The rural nature and limited resources in South Dakota demand innovation and commitment. Our leadership remains dedicated to enhancing the health of patients and continually strives to improve susceptibility patterns throughout the state. Working together, one day at a time, the challenge is transforming into a success story that we can be proud of, and a vast opportunity to improve the health of patients in South Dakota.

Core Elements of Outpatient Antibiotic Stewardship

The unintended consequences of inappropriate prescribing practices contribute to the development of multi-drug resistant organisms. The South Dakota Department of Health, Healthcare-Associated Infections and Antimicrobial Resistance Program is actively engaged in steps to prevent antimicrobial resistance. Through collaboration with statewide healthcare facilities, the department works to improve antibiotic prescribing, prevent infections and the spread of resistant bacteria, and monitor antibiotic- resistant infections of public health interest like *Carbapenem-resistant Enterobacteraceae*.

The Core Elements of Outpatient Antibiotic Stewardship, published by the Centers for Disease Control and Prevention, provides a framework for antibiotic stewardship for outpatient clinicians and facilities that routinely provide antibiotic treatment. The core elements augment existing guidance for other clinical settings and are reprinted on the following pages. The core elements are reprinted on the following pages.

In addition, the South Dakota Antimicrobial Stewardship Workgroup authored guidelines for the care of pediatric upper respiratory conditions (http://doh.sd.gov/diseases/hai/pediatricUrguidelines.aspx) in support of outpatient stewardship. South Dakota facility leadership interested in participating on the SD Antimicrobial Stewardship Workgroup should contact Angela Jackley at Angela.Jackley@state.sd.us or 605-773-5348. The department invites you to become a Partner in Prevention.

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Core Elements of Outpatient Antibiotic Stewardship

Continuing Education Examination available at http://www.cdc.gov/mmwr/cme/conted.html.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

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Core Elements of Outpatient Antibiotic Stewardship

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Summary

The Core Elements of Outpatient Antibiotic Stewardship *provides a framework for antibiotic stewardship for outpatient clinicians and facilities that routinely provide antibiotic treatment. This report augments existing guidance for other clinical settings. In 2014 and 2015, respectively, CDC released the* Core Elements of Hospital Antibiotic Stewardship Programs *and the* Core Elements of Antibiotic Stewardship for Nursing Homes. *Antibiotic stewardship is the effort to measure and improve how antibiotics are prescribed by clinicians and used by patients. Improving antibiotic prescribing involves implementing effective strategies to modify prescribing practices to align them with evidence-based recommendations for diagnosis and management. The four core elements of outpatient antibiotic stewardship are commitment, action for policy and practice, tracking and reporting, and education and expertise. Outpatient clinicians and facility leaders can commit to improving antibiotic prescribing and take action by implementing at least one policy or practice aimed at improving antibiotic prescribing practices. Clinicians and leaders of outpatient clinics and health care systems can track antibiotic prescribing practices and regularly report these data back to clinicians. Clinicians can provide educational resources to patients and families on appropriate antibiotic use. Finally, leaders of outpatient clinics and health systems can provide clinicians with education aimed at improving antibiotic prescribing and with access to persons with expertise in antibiotic stewardship. Establishing effective antibiotic stewardship interventions can protect patients and improve clinical outcomes in outpatient health care settings.*

Introduction

Antibiotic resistance is among the greatest public health threats today, leading to an estimated 2 million infections and 23,000 deaths per year in the United States (*1*). Although antibiotics are life-saving drugs that are critical to modern medicine, infections with pathogens resistant to first-line antibiotics can require treatment with alternative antibiotics that can be expensive and toxic. Antibiotic-resistant infections can lead to increased health care costs and, most importantly, to increased morbidity and mortality (*1*). The most important modifiable risk factor for antibiotic resistance is inappropriate prescribing of antibiotics. Approximately half of outpatient antibiotic prescribing in humans might be inappropriate, including antibiotic selection, dosing, or duration, in addition to unnecessary antibiotic prescribing (*2–4*). At least 30% of outpatient antibiotic prescriptions in the United States are unnecessary (*5*).

Antibiotic stewardship is the effort to measure antibiotic prescribing; to improve antibiotic prescribing by clinicians and use by patients so that antibiotics are only prescribed and used when needed; to minimize misdiagnoses or delayed diagnoses leading to underuse of antibiotics; and to ensure that the right drug, dose, and duration are selected when an antibiotic is needed (*1,6*). Antibiotic stewardship can be used in all health care settings in which antibiotics are prescribed and remains a cornerstone of efforts aimed at improving antibiotic-related patient safety and slowing the spread of antibiotic resistance. The goal of antibiotic stewardship is to maximize the benefit of antibiotic treatment while minimizing harm both to individual persons and to communities.

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Background

Improving antibiotic prescribing in all health care settings is critical to combating antibiotic-resistant bacteria (*7*). Approximately 60% of U.S. antibiotic expenditures for humans are related to care received in outpatient settings (*8*). In other developed countries, approximately 80%–90% of antibiotic use occurs among outpatients (*9,10*). During 2013 in the United States, approximately 269 million antibiotic prescriptions were dispensed from outpatient pharmacies (*11*). Approximately 20% of pediatric visits (*12*) and 10% of adult visits (*3*) in outpatient settings result in an antibiotic prescription. Complications from antibiotics range from common side effects such as rashes and diarrhea to less common adverse events such as severe allergic reactions (*13*). These adverse drug events lead to an estimated 143,000 emergency

department visits annually and contribute to excess use of health care resources (*13*). Antibiotic treatment is the most important risk factor for *Clostridium difficile* infection (*14*). In 2011, an estimated 453,000 cases of *C. difficile* infection occurred in the United States, approximately one third of which were community-associated infections (i.e., occurred in patients with no recent overnight stay in a health care facility) (*15*). As much as 35% of adult and 70% of pediatric *C. difficile* infections are community associated (*15*,*16*). One study estimated that a 10% reduction in overall outpatient antibiotic prescribing could reduce community-associated *C. difficile* infections by 17% (*17*). By reducing unnecessary antibiotic prescribing (*18*–*20*), antibiotic stewardship can prevent avoidable adverse events resulting from antibiotics.

In 2014 and 2015, respectively, CDC released the *Core Elements of Hospital Antibiotic Stewardship Programs (21,22)* and the *Core Elements of Antibiotic Stewardship for Nursing Homes* (*23*). This 2016 report, *Core Elements of Outpatient Antibiotic Stewardship,* provides guidance for antibiotic stewardship in outpatient settings and is applicable to any entity interested in improving outpatient antibiotic prescribing and use. The intended audiences for this guidance include clinicians (e.g., physicians, dentists, nurse practitioners, and physician assistants) and clinic leaders in primary care, medical and surgical specialties, emergency departments, retail health and urgent care settings, and dentistry, as well as community pharmacists, other health care professionals, hospital clinics, outpatient facilities, and health care systems involved in outpatient care (Box 1).

Leaders of organizations of any size and within any medical specialty, from single-provider clinics to large health care systems, are encouraged to commit to optimizing antibiotic prescribing and patient safety; implement at least one action in the form of a policy or practice to improve antibiotic prescribing; track and regularly report antibiotic prescribing practices to clinicians or enable clinician self-assessment on antibiotic prescribing; educate clinicians and patients on appropriate antibiotic prescribing; and ensure access to expertise on antibiotic prescribing. Before implementing antibiotic stewardship interventions, clinicians and outpatient clinic and

BOX 1. Entities that are intended audiences for *Core Elements of Outpatient Antibiotic Stewardship*

Entities that are intended audiences for this report are outpatient health care professionals and leaders of their respective clinics, departments, facilities, and health care systems.

- **Primary care clinics and clinicians:** These clinics and clinicians prescribe approximately half of all outpatient antibiotics in the United States.* This includes clinicians specializing in family practice, pediatrics, and internal medicine, all of whom treat a wide variety of patients and conditions that might benefit from antibiotic treatment.
- **Outpatient specialty and subspecialty clinics and clinicians:** These clinics and clinicians focus on treatment and management of patients with specialized medical conditions that sometimes benefit from antibiotic therapy. These specialties clinics include gastroenterology, dermatology, urology, obstetrics, otolaryngology, and others.
- **Emergency departments (EDs) and emergency medicine clinicians:** EDs and emergency medicine clinicians are positioned between acute care hospitals and the community and encounter unique challenges, including lack of continuity of care and higher concentration of high-acuity patients, as well as unique opportunities for stewardship interventions, such as greater clinician access to diagnostic resources and the expertise of pharmacists and consultants.
- **Retail health clinics and clinicians:** These clinics and clinicians provide treatment for routine conditions in retail stores or pharmacies and represent a growing category of health care delivery in the United States.
- **Urgent care clinics and clinicians:** These clinics and clinicians specialize in treating patients who might need immediate attention or need to be seen after hours but might not need to be seen in EDs.
- **Dental clinics and dentists:** Dental clinics and dentists use antibiotics as prophylaxis before some dental procedures and for treatment of dental infections.
- **Nurse practitioners and physician assistants:** These clinicians work in every medical specialty and subspecialty involved in antibiotic prescribing and should be included in antibiotic stewardship efforts.
- **Health care systems:** Health care systems plan, deliver, and promote health care services and often involve a network of primary and specialty outpatient clinics, urgent care centers, EDs, acute care hospitals, and other facilities that provide health care services. Health care systems can use existing antibiotic stewardship programs or develop new ones to promote appropriate antibiotic prescribing practices in their outpatient facilities as well as across the system.

*__Source:__ CDC. Outpatient antibiotic prescriptions—United States, 2013. Atlanta, GA: US Department of Health and Human Services, CDC; 2013. http://www.cdc.gov/getsmart/community/pdfs/annual-reportsummary_2013.pdf

health system leaders can identify opportunities to improve antibiotic prescribing. These opportunities include identifying high-priority conditions for intervention, identifying barriers that lead to deviation from best practices, and establishing standards for antibiotic prescribing based on evidence-based diagnostic criteria and treatment recommendations (Box 2). High-priority conditions are conditions for which clinicians commonly deviate from best practices for antibiotic prescribing and include conditions for which antibiotics are overprescribed, underprescribed, or misprescribed with the wrong antibiotic agent, dose, or duration. Barriers to prescribing antibiotics appropriately might include clinician knowledge gaps about best practices and clinical practice guidelines, clinician perception of patient expectations for antibiotics, perceived pressure to see patients quickly, or clinician concerns about decreased patient satisfaction with clinical visits when antibiotics are not prescribed. Standards for antibiotic prescribing can be based on national clinical practice

BOX 2. Initial steps for antibiotic stewardship: recognize opportunities to improve antibiotic prescribing practices by identifying high-priority conditions, identifying barriers to improving antibiotic prescribing, and establishing standards for antibiotic prescribing

Identify one or more high-priority conditions for intervention.

High-priority conditions are conditions for which clinicians commonly deviate from best practices for antibiotic prescribing and include conditions for which antibiotics are overprescribed, underprescribed, or misprescribed with the wrong antibiotic agent, dose, or duration.

Examples of types of high-priority conditions for improving antibiotic prescribing include:

- conditions for which antibiotics are overprescribed, such as conditions for which antibiotics are not indicated (e.g., acute bronchitis, nonspecific upper respiratory infection, or viral pharyngitis).*
- conditions for which antibiotics might be appropriate but are overdiagnosed, such as a condition that is diagnosed without fulfilling the diagnostic criteria (e.g., diagnosing streptococcal pharyngitis and prescribing antibiotics without testing for group A *Streptococcus*).†
- conditions for which antibiotics might be indicated but for which the wrong agent, dose, or duration often is selected, such as selecting an antibiotic that is not recommended (e.g., selecting azithromycin rather than amoxicillin or amoxicillin/clavulanate for acute uncomplicated bacterial sinusitis).§
- conditions for which watchful waiting or delayed prescribing is appropriate but underused (e.g., acute otitis media or acute uncomplicated sinusitis).¶
- conditions for which antibiotics are underused or the need for timely antibiotics is not recognized (e.g., missed diagnoses of sexually transmitted diseases or severe bacterial infections such as sepsis).

Identify barriers that lead to deviation from best practices.

These might include clinician knowledge gaps about best practices and clinical practice guidelines, clinician perception of patient expectations for antibiotics, perceived pressure to see patients quickly, or clinician concerns about decreased patient satisfaction with clinical visits when antibiotics are not prescribed.

Establish standards for antibiotic prescribing.

This might include implementation of national clinical practice guidelines and, if applicable, developing facility- or system-specific clinical practice guidelines to establish clear expectations for appropriate antibiotic prescribing.

* **Sources:** Shulman ST, Bisno AL, Clegg HW, et al. Clinical practice guideline for the diagnosis and management of group A streptococcal pharyngitis: 2012 update by the Infectious Diseases Society of America. Clin Infect Dis 2012;55:1279–82; Harris AM, Hicks LA, Qaseem A; High Value Care Task Force of the American College of Physicians; CDC. Appropriate antibiotic use for acute respiratory tract infection in adults: advice for high-value care from the American College of Physicians and the Centers for Disease Control and Prevention. Ann Intern Med 2016;164:425–34; and Hersh AL, Jackson MA, Hicks LA; American Academy of Pediatrics Committee on Infectious Diseases. Principles of judicious antibiotic prescribing for upper respiratory tract infections in pediatrics. Pediatrics 2013;132:1146–54.

† **Source:** Shulman ST, Bisno AL, Clegg HW, et al. Clinical practice guideline for the diagnosis and management of group A streptococcal pharyngitis: 2012 update by the Infectious Diseases Society of America. Clin Infect Dis 2012;55:1279–82.

§ **Sources:** Chow AW, Benninger MS, Brook I, et al; Infectious Diseases Society of America. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. Clin Infect Dis 2012;54:e72–112; Wald ER, Applegate KE, Bordley C, et al; American Academy of Pediatrics. Clinical practice guideline for the diagnosis and management of acute bacterial sinusitis in children aged 1 to 18 years. Pediatrics 2013;132:e262–80; and Rosenfeld RM, Piccirillo JF, Chandrasekhar SS, et al. Clinical practice guideline (update): adult sinusitis executive summary. Otolaryngol Head Neck Surg 2015;152:598–609.

¶ **Sources:** Lieberthal AS, Carroll AE, Chonmaitree T, et al. The diagnosis and management of acute otitis media. Pediatrics 2013;131:e964–99; Wald ER, Applegate KE, Bordley C, et al; American Academy of Pediatrics. Clinical practice guideline for the diagnosis and management of acute bacterial sinusitis in children aged 1 to 18 years. Pediatrics 2013;132:e262–80; and Rosenfeld RM, Piccirillo JF, Chandrasekhar SS, et al. Clinical practice guideline (update): adult sinusitis executive summary. Otolaryngol Head Neck Surg 2015;152:598–609.

guidelines by national health care professional societies such as the American Academy of Pediatrics, the American College of Physicians, or the Infectious Diseases Society of America or, if applicable, can be based on facility- or system-specific clinical practice guidelines. A summary of current national clinical practice guidelines for common outpatient infections in children and adults is available at http://www.cdc.gov/getsmart/community/for-hcp/outpatient-hcp/index.html.

Clinicians and clinic leaders can collaborate with relevant partners in the broader health care community to facilitate outpatient antibiotic stewardship (Box 3). To improve antibiotic prescribing, clinic leaders can implement effective strategies to modify prescribing behaviors and align them with evidence-based recommendations for diagnosis and management (*1*). Clinicians can expect outpatient antibiotic stewardship to improve the quality of patient care, slow the development of community antibiotic resistance, and reduce avoidable adverse drug events caused by unnecessary use of antibiotics (*24*,*25*).

Methods

CDC's *Core Elements of Outpatient Antibiotic Stewardship* were developed through a combination of consolidating evidence-based antibiotic stewardship practices and building on or adapting known best practices for antibiotic stewardship across other clinical settings, such as the core elements outlined for hospitals *(21*,*22)* and nursing homes (*23*). A narrative review of evidence on outpatient antibiotic stewardship interventions, policies, and practices through May 2016 was conducted. A systematic review was not conducted because at least five systematic reviews on outpatient stewardship interventions have been performed since 2005 (*24*–*28*), of which the two most recent were published in 2015 and 2016 (*24*,*25*). The narrative review included the five systematic reviews (*24*–*28*), articles found through in-text citations, and new articles from a supplemental search of articles published during October 2015–May 2016. Information from selected citations included in the systematic reviews also was considered if it had not been specified previously in the systematic review. The supplemental search of PubMed identified English-language articles only published during October 2015–May 2016 with the following search terms: "antibiotic stewardship" or "antibiotic prescribing" or "antibiotic prescriptions" or "antimicrobial stewardship" or ("antibiotic" and "stewardship") or ("antimicrobial" and "stewardship"). Articles identified through these methods were prioritized and included on the basis of relevance to outpatient antibiotic stewardship, defined as having 1) clearly stated study objectives to identify factors affecting outpatient antibiotic prescribing or to assess one or more outpatient antibiotic stewardship interventions, 2) been performed in outpatient settings similar to those common in the United States (e.g., study settings in which patients access antibiotics through prescriptions written by a clinician), 3) effectively reported outcomes related to antibiotic stewardship, 4) enrolled subjects with outpatient infections common in the United States, or 5) been previously cited as archetypal studies for stewardship interventions (http://www.cdc.gov/getsmart/community/improving-prescribing/interventions/index.html); included studies are available online at https://stacks.cdc.gov/view/cdc/41536). When no peer-reviewed evidence was available, expert opinion was substituted.

CDC identified subject-matter experts in outpatient antibiotic stewardship research, implementation, policy, and practice on the basis of peer-reviewed publications with representation from important outpatient specialties. Subject-matter experts were identified with expertise in pediatrics, internal medicine, family medicine, emergency medicine, infectious diseases, and pharmacy. CDC provided eight subject-matter experts with a draft of the core elements in April 2016. Subject-matter experts were asked for specific feedback on the feasibility, acceptability, recommended supplementary materials, and potential for the core elements to promote effective and meaningful improvements in outpatient antibiotic prescribing. In addition to written feedback via electronic correspondence, a 1-hour group teleconference was offered to all subject-matter experts, during which verbal feedback from each person was collected. CDC revised and refined the core elements using individual feedback received from the subject-matter experts.

Core Elements of Outpatient Antibiotic Stewardship

The *Core Elements of Outpatient Antibiotic Stewardship* follow and are summarized in a clinician checklist (Figure 1) and a facility checklist (Figure 2):

- **Commitment:** Demonstrate dedication to and accountability for optimizing antibiotic prescribing and patient safety.
- **Action for policy and practice:** Implement at least one policy or practice to improve antibiotic prescribing, assess whether it is working, and modify as needed.
- **Tracking and reporting:** Monitor antibiotic prescribing practices and offer regular feedback to clinicians, or have clinicians assess their own antibiotic prescribing practices themselves.

BOX 3. Potential partners for outpatient antibiotic stewardship activities

- **Acute care hospitals:** Acute care hospitals are a critical component of the continuum of care and often share patients with outpatient clinics. Information sharing between outpatient facilities and acute care hospitals is necessary to monitor local patterns of antibiotic resistance, minimize duplicative testing, facilitate proper patient transition across different care settings, and collaborate on quality improvement initiatives. In addition, hospital-based antibiotic stewardship programs might be a resource for expertise in outpatient antibiotic stewardship initiatives.
- **Long-term care facilities:** Long-term care facilities provide various services, such as medical and personal care, to patients who are unable to manage independently in the community. Long-term care facilities include rehabilitation facilities, nursing homes, and long-term acute care facilities. Residents of long-term care facilities also are often treated by outpatient clinicians, including medical specialists. Thus, communication between outpatient clinicians and long-term care facilities is critical to antibiotic stewardship efforts.
- **State and local health departments:** State and local health departments play a crucial role in promoting outpatient antibiotic stewardship by sharing educational resources, connecting local stakeholders and coalitions, designating staff members to improve coordination within and across health care facilities, tracking and reporting local antibiotic resistance threats, and promoting infection prevention and vaccinations.
- **Health plans and payers (health insurance companies):** Health plans and payers can be a crucial source of data for clinician performance on quality measures for appropriate prescribing, including the Healthcare Effectiveness Data and Information Set (HEDIS) measures. In addition, health plans can provide incentives for antibiotic stewardship through quality-based payments.
- **Health care professional societies:** Health care professional societies provide an important network of health care professionals and health care leaders to create and share clinical practice guidelines for diagnosis and management of common conditions, provide continuing medical education opportunities for members, and bolster national, local, and regional initiatives promoting appropriate antibiotic use.
- **Community pharmacies and pharmacists:** Community pharmacies and pharmacists are a trusted source of health care information and provide patient recommendations for nonprescription medications to alleviate symptoms, facilitate medication therapy management, screen patients for drug interactions and allergies, and educate patients regarding appropriate antibiotic use and anticipated side effects. Pharmacies frequently are located near clinics in which patients are seen for management of common infections.
- **Local microbiologic laboratories:** Local microbiologic laboratories can produce regional or local antibiograms (i.e., tables displaying selected antibiotic sensitivities of bacterial species identified from clinical specimens) relevant to the setting of care, streamline testing and reporting of clinical samples, support rapid diagnostic testing, and provide expertise for interpretation of microbiologic tests.

Other important partners in outpatient stewardship include academic institutions, health professional training programs, information technology and electronic medical record software personnel, consumer advocacy groups, pharmaceutical companies, and health sciences education programs.

- **Education and expertise:** Provide educational resources to clinicians and patients on antibiotic prescribing, and ensure access to needed expertise on optimizing antibiotic prescribing.

Commitment

A commitment from all health care team members to prescribe antibiotics appropriately and engage in antibiotic stewardship is critical to improving antibiotic prescribing. Every person involved in patient care, whether directly or indirectly, can act as an antibiotic steward. Each clinician can make the choice to be an effective antibiotic steward during each patient encounter.

Clinicians can demonstrate commitment to appropriate antibiotic prescribing by doing the following:

- **Write and display public commitments in support of antibiotic stewardship.** For example, inappropriate antibiotic prescriptions for acute respiratory infections were reduced after clinicians displayed, in their examination rooms, a poster showing a letter from the clinician to their patients committing to prescribing antibiotics appropriately (*18*). This approach also might facilitate patient communication about appropriate antibiotic use.

FIGURE 1. Clinician checklist for core elements of outpatient antibiotic stewardship

CDC recommends that outpatient clinicians take steps to implement antibiotic stewardship activities. Use this checklist as a baseline assessment of policies and practices that are in place. Then use the checklist to review progress in expanding stewardship activities on a regular basis (e.g., annually).	
Commitment	
1. Can you demonstrate dedication to and accountability for optimizing antibiotic prescribing and patient safety related to antibiotics?	❑ *Yes* ❑ *No*
If yes, indicate which of the following are in place. ❑ Write and display public commitments in support of antibiotic stewardship.	
Action	
2. Have you implemented at least one practice to improve antibiotic prescribing?	❑ *Yes* ❑ *No*
If yes, indicate which practices which you use. (Select all that apply.) ❑ Use evidence-based diagnostic criteria and treatment recommendations. ❑ Use delayed prescribing practices or watchful waiting, when appropriate.	
Tracking and Reporting	
3. Do you monitor at least one aspect of antibiotic prescribing?	❑ *Yes* ❑ *No*
If yes, indicate which of the following are being tracked. (Select all that apply.) ❑ Self-evaluate antibiotic prescribing practices. ❑ Participate in continuing medical education and quality improvement activities to track and improve antibiotic prescribing.	
Education and Expertise	
4. Do you provide education to patients and seek out continuing education on antibiotic prescribing?	❑ *Yes* ❑ *No*
If yes, indicate how you provide antibiotic stewardship education. (Select all that apply.) ❑ Use effective communications strategies to educate patients about when antibiotics are and are not needed. ❑ Educate about the potential harms of antibiotic treatment. ❑ Provide patient education materials.	

FIGURE 2. Facility checklist for core elements of outpatient antibiotic stewardship

CDC recommends that outpatient care facilities take steps to implement antibiotic stewardship activities. Use this checklist as a baseline assessment of policies and practices that are in place. Then use the checklist to review progress in expanding stewardship activities on a regular basis (e.g., annually).	
Commitment	
1. Can your facility demonstrate dedication to and accountability for optimizing antibiotic prescribing and patient safety related to antibiotics?	❑ *Yes* ❑ *No*
If yes, indicate which of the following are in place. (Select all that apply.) ❑ Identify a single leader to direct antibiotic stewardship activities within a facility. ❑ Include antibiotic stewardship-related duties in position descriptions or job evaluation criteria. ❑ Communicate with all clinic staff members to set patient expectations.	
Action	
2. Has your facility implemented at least one policy or practice to improve antibiotic prescribing?	❑ *Yes* ❑ *No*
If yes, indicate which interventions are in place. (Select all that apply.) ❑ Provide communications skills training for clinicians. ❑ Require explicit written justification in the medical record for nonrecommended antibiotic prescribing. ❑ Provide support for clinical decisions. ❑ Use call centers, nurse hotlines, or pharmacist consultations as triage systems to prevent unnecessary visits.	
Tracking and Reporting	
3. Does your facility monitor at least one aspect of antibiotic prescribing?	❑ *Yes* ❑ *No*
If yes, indicate which of the following are being tracked. (Select all that apply.) ❑ Track and report antibiotic prescribing for one or more high-priority conditions. ❑ Track and report the percentage of all visits leading to antibiotic prescriptions. ❑ (If already tracking and reporting one of the above) Track and report, at the level of a health care system, complications of antibiotic use and antibiotic resistance trends among common outpatient bacterial pathogens. ❑ Assess and share performance on quality measures and established reduction goals addressing appropriate antibiotic prescribing from health care plans and payers.	
Education and Expertise	
4. Does your facility provide resources to clinicians and patients on evidence-based antibiotic prescribing?	❑ *Yes* ❑ *No*
If yes, indicate how your facility provides antibiotic stewardship education. (Select all that apply.) ❑ Provide face-to-face educational training (academic detailing). ❑ Provide continuing education activities for clinicians. ❑ Ensure timely access to persons with expertise.	

Outpatient clinic and health care system leaders can commit to promoting appropriate antibiotic prescribing by doing any of the following:

- **Identify a single leader to direct antibiotic stewardship activities within a facility.** Appointing a single leader who is accountable to senior facility leaders is recommended for hospital stewardship programs (*21*,*22*), and this approach also might be beneficial in outpatient settings.
- **Include antibiotic stewardship-related duties in position descriptions or job evaluation criteria.** These duties can be listed for medical directors, nursing leadership positions, and practice management personnel and will help ensure staff members have sufficient time and resources to devote to stewardship. Although evidence in the outpatient settings is lacking, this type of leadership support has been shown to be important for hospital antibiotic stewardship programs (*29*).
- **Communicate with all clinic staff members to set patient expectations.** Patient visits for acute illnesses might or might not result in an antibiotic prescription. All staff members in outpatient facilities, including administrative staff members, medical assistants, nurses, allied health professionals, and medical directors, can improve antibiotic prescribing by using consistent messages when communicating with patients about the indications for antibiotics.

Action for Policy and Practice

Outpatient clinicians and clinic leaders can implement policies and interventions to promote appropriate antibiotic prescribing practices. A stepwise approach with achievable goals can facilitate policy and practice changes and help clinicians and staff members from feeling overwhelmed. As with all quality improvement efforts, assessment and modification of implemented policies and interventions are critical to improving antibiotic prescribing practices. Prioritizing interventions according to feasibility, acceptability, resource commitment, and anticipated barriers to change is important. Action is necessary to transform policy and practice into measurable outcomes.

Clinicians can implement at least one of the following actions to improve antibiotic prescribing:

- **Use evidence-based diagnostic criteria and treatment recommendations.** When possible, these criteria and recommendations should be based on national or local clinical practice guidelines informed by local pathogen susceptibilities. This can be accomplished by adhering to recommendations from clinical practice guidelines for common infections published by national professional societies such as the American Academy of Pediatrics and the Infectious Diseases Society of America (*30*–*35*).
- **Use delayed prescribing practices or watchful waiting, when appropriate.** Delayed prescribing can be used for patients with conditions that usually resolve without treatment but who can benefit from antibiotics if the conditions do not improve (e.g., acute uncomplicated sinusitis or mild acute otitis media). Clinicians can apply delayed prescribing practices by giving the patient or parent a postdated prescription and providing instructions to fill the prescription after a predetermined period or by instructing the patient to call or return to collect a prescription if symptoms worsen or do not improve (*36*–*40*). Watchful waiting means providing symptomatic relief with a clear plan for follow-up if infection symptoms worsen or do not improve. Watchful waiting and delayed antibiotic prescriptions are evidence-based approaches that can safely decrease antibiotic use when used in accordance with clinical practice guidelines (*41*–*44*).

Outpatient clinic and health care system leaders can take at least one of the following actions to improve antibiotic prescribing based on established standards or national clinical practice guidelines:

- **Provide communications skills training for clinicians.** Communications skills training can be used to promote strategies to address patient concerns regarding prognosis, benefits, and harms of antibiotic treatment; management of self-limiting conditions; and clinician concerns regarding managing patient expectations for antibiotics during a clinical visit (*45*,*46*).
- **Require explicit written justification in the medical record for nonrecommended antibiotic prescribing.** This technique has reduced inappropriate prescribing by holding clinicians accountable in the medical record for their decisions (*19*).
- **Provide support for clinical decisions.** Clinical decision support, which provides specific information in electronic or print form during the typical workflow, can facilitate accurate diagnoses and effective management of common conditions (e.g., discouraging antibiotic prescribing for acute bronchitis in healthy adults) (*47*–*52*).
- **Use call centers, nurse hotlines, or pharmacist consultations as triage systems to prevent unnecessary visits**. These resources can be used to reduce unnecessary visits for conditions that do not require a clinic visit (*53*), such as a common cold.

Tracking and Reporting

Tracking and reporting clinician antibiotic prescribing, also called audit and feedback, can guide changes in practice and be used to assess progress in improving antibiotic prescribing. When setting up tracking and reporting systems, decisions need to be made about the level at which to track and report (i.e., at the individual clinician level or at the facility level), which outcomes to track and report, and how to obtain the data for tracking and reporting. Sources of data might include automatic electronic medical record extraction, manual periodic chart reviews, or performance data on existing quality measures related to outpatient antibiotic prescribing (e.g., Healthcare Effectiveness Data and Information Set [HEDIS] measures). Analysis can occur at the individual clinician level or at the facility level (i.e., aggregate of all clinician antibiotic prescriptions). The preferred approach, when possible, is to track antibiotic prescribing at the individual clinician level. Individualized feedback provided to clinicians on antibiotic prescribing is an effective way to promote adherence to evidence-based guidelines (*20*,*54*–*56*). Effective feedback interventions have included comparison of clinicians' performance with that of their peers (*20*), particularly with peers who perform in the top 10% on quality measures or in adherence to evidence-based guidelines (i.e., top-performing peers) (*19*). In turn, feedback from clinicians about stewardship interventions can help guide modifications to maximize the impact and improve the acceptability of stewardship interventions (*57*). In addition, a study that informed certain clinicians that they prescribed more antibiotics than 80% of their peers also resulted in reductions in overall antibiotic prescribing (*58*).

Tracking and reporting for identified high-priority conditions can be used to assess whether an antibiotic was appropriate for the assigned diagnosis, whether the diagnostic criteria were met before assigning an antibiotic-appropriate diagnosis, whether the selected antibiotic was the recommended agent, and whether the dose and duration were correct. Outpatient clinicians and clinic or health care system leaders can select outcomes to track and report on the basis of identified opportunities for improvement in their practice or clinics. Systems can track high-priority conditions identified as opportunities to improve clinician adherence to best practices and clinical practice guidelines for antibiotic prescribing (Box 2). For example, acute bronchitis is a common condition for which antibiotics are not recommended in national clinical practice guidelines, yet antibiotics are commonly prescribed (*59*,*60*). Therefore, leaders might choose to provide feedback on the percentage of acute bronchitis visits in which a clinician prescribed an antibiotic and include comparisons with their peers' prescribing percentages for acute bronchitis. This paired tracking and reporting approach for selected high-priority conditions has reduced inappropriate antibiotic prescribing and improved antibiotic selection (*19*,*20*).

Systems also can track the percentage of visits for which an individual clinician prescribes antibiotics (e.g., number of all antibiotics prescribed for all diagnoses by a clinician divided by the total number of visits for all diagnoses for that clinician). Providing clinicians with these individualized percentages in comparison with their peers has reduced antibiotic prescribing (*58*) and can help minimize the influence of differences in clinicians' diagnostic coding practices. A practice known as diagnosis shifting occurs when a clinician manipulates a diagnostic code to justify prescribing an antibiotic; for example, a clinician might record the code for pneumonia (which requires an antibiotic) when a patient has acute bronchitis (which does not require an antibiotic). Diagnosis shifting can be missed when tracking and reporting only one high-priority condition (e.g., only acute bronchitis), whereas tracking the percentage of all visits leading to antibiotic prescriptions is not affected by diagnosis shifting. However, when comparing metrics for antibiotic stewardship, the comparability of the clinicians' patient populations should be considered because clinicians might treat patients with different underlying needs for antibiotics (e.g., a clinician who cares for a higher percentage of patients with immunosuppression than other clinicians in their clinic).

Certain health care systems also might be able to track and report the complications of antibiotic use (e.g., *C. difficile* infections, drug interactions, and adverse drug events) and antibiotic resistance trends among common outpatient bacterial pathogens (*24*). At the individual or clinic level, smaller sample sizes might make these measures less reliable or useful. In these cases, investigating *C. difficile* infections to assess for possible links to previous ambulatory care visits and antibiotic prescriptions might be used as a marker for possible adverse drug events.

Both clinicians and clinic leaders can be involved in antibiotic stewardship. Clinicians can track and report their own antibiotic prescribing practices by doing at least one of the following:

- **Self-evaluate antibiotic prescribing practices.** Clinicians can use self-evaluations to align their antibiotic prescribing practices with updated evidence-based recommendations and clinical practice guidelines.
- **Participate in continuing medical education and quality improvement activities to track and improve antibiotic prescribing.** Activities can be tailored by clinical specialty if conducted through health professional organizations and also might be used to meet licensure and other education and quality improvement requirements.

Outpatient clinic or health care system leaders can do at least one of the following:

- **Implement at least one antibiotic prescribing tracking and reporting system.** Outcomes to be tracked can include high-priority conditions that have been identified as opportunities for improvement in that clinic, the percentage of all visits leading to antibiotic prescriptions, and, for health systems, complications of antibiotic use and antibiotic resistance trends (if antibiotic prescribing outcomes are already being tracked). Outcomes can be tracked and reported by individual clinicians (which is preferred) and by facilities.
- **Assess and share performance on quality measures and established reduction goals addressing appropriate antibiotic prescribing from health care plans and payers.** The National Strategy for Combating Antibiotic-Resistant Bacteria aims to reduce inappropriate antibiotic use by 50% for monitored conditions in outpatient settings by 2020 (*61*). Current HEDIS measures include quality measures for appropriate testing for children with pharyngitis, appropriate treatment for children with upper respiratory infections (i.e., avoidance of antibiotics), and avoidance of antibiotic treatment in adults with acute bronchitis (*62*).

Education and Expertise

Education on appropriate antibiotic use can involve patients and clinicians. Education for patients and family members can improve health literacy and augment efforts to improve antibiotic use. Education for clinicians and clinic staff members can reinforce appropriate antibiotic prescribing and improve the quality of care (*56*,*63*,*64*). Deficits in clinician knowledge are seldom the only barrier to prescribing antibiotics appropriately in the outpatient setting. Effective clinician education often includes reviewing guidelines for appropriate antibiotic prescribing while also addressing the psychosocial pressures that influence antibiotic prescribing practices of clinicians (e.g., clinicians' concerns about patient satisfaction). Access to colleagues and consultants with expertise (e.g., pharmacists and specialists) also is a valuable resource for improving antibiotic prescribing.

Clinicians can educate patients and families about appropriate antibiotic use by doing at least one of the following:

- **Use effective communications strategies to educate patients about when antibiotics are and are not needed.** For example, patients should be informed that antibiotic treatment for viral infections provides no benefit and thus should not be used for viral infections. Patients also should be informed that certain bacterial infections (e.g., mild ear and sinus infections) might improve without antibiotics. Explanations of when antibiotics are not needed can be combined with recommendations for symptom management; this combination of messages has been associated with visit satisfaction (*65*). In addition, providing recommendations for when to seek medical care if patients worsen or do not improve (i.e., a contingency plan) has been associated with higher visit satisfaction scores among patients who expected but were not prescribed antibiotics (*66*).
- **Educate patients about the potential harms of antibiotic treatment.** Potential harms might include common and sometimes serious side effects of antibiotics, including nausea, abdominal pain, diarrhea, *C. difficile* infection, allergic reactions, and other serious reactions. Parents of young children, in particular, want to be informed about possible adverse events associated with antibiotics (*67*). In addition, increasing evidence suggests antibiotic use in infancy and childhood is linked with allergic, infectious, and autoimmune diseases, likely through disturbing the microbiota (i.e., microorganisms within and on the human body) (*68*).
- **Provide patient education materials.** These materials might include information on appropriate antibiotic use, potential adverse drug events from antibiotics, and available resources regarding symptomatic relief for common infections. Educational materials on management of common infections are available online from CDC (http://www.cdc.gov/getsmart).

Outpatient clinic and health care system leaders can provide education to clinicians and ensure access to expertise by doing at least one of the following:

- **Provide face-to-face educational training (academic detailing).** This training can be provided by peers, colleagues, or opinion leaders, including other clinicians and pharmacists, and uses reinforcement techniques and peer-to-peer comparisons to facilitate changes in antibiotic prescribing practices (*69*–*71*).
- **Provide continuing education activities for clinicians.** Relevant continuing education activities include those that address appropriate antibiotic prescribing, adverse drug events, and communication strategies about appropriate antibiotic prescribing that can improve patient satisfaction. In particular, communications training in which clinicians were taught to assess patient expectations, discuss the risks and benefits of antibiotic treatment, provide recommendations for when to seek medical care if worsening or not improving (a contingency plan), and assess the patient's understanding of the communicated information led to sustained decreases in inappropriate antibiotic prescribing (*46*,*72*).

- **Ensure timely access to persons with expertise.** Persons with expertise might include pharmacists or medical and surgical consultants who can assist clinicians in improving antibiotic prescribing for patients with conditions requiring specialty care. For example, in hospitals, pharmacists with infectious disease training have been effective and important members of antibiotic stewardship programs, and in hospital stewardship programs these types of pharmacists have been associated with improved patient outcomes and overall cost savings for the hospital (*73*). The expertise needed might differ among outpatient facilities and can be determined by each facility.

Future Directions

The *Core Elements of Outpatient Antibiotic Stewardship* provides a framework for improving antibiotic prescribing. Expanding horizons for outpatient health care delivery, such as outpatient parenteral antibiotic therapy, telemedicine and telehealth, and urgent care and retail clinics, might require unique stewardship approaches. Several studies have been published that show the benefit of antibiotic stewardship interventions in traditional primary care clinics (*18*,*38*,*42*). Additional implementation research is needed to determine which outpatient stewardship interventions work best in different outpatient settings, effective strategies to implement interventions, and sustainable approaches to outpatient stewardship.

Acute respiratory tract infections have been a focus of outpatient stewardship because these are the most common conditions leading to antibiotic treatment. However, additional efforts are needed to optimize stewardship efforts for other situations and syndromes that commonly lead to antibiotic use in the outpatient setting, including ambulatory procedures, dental prophylaxis, genitourinary infections, acne and other skin and soft tissue conditions, and chronic obstructive pulmonary disease.

Conclusion

Although the core elements provide a framework for outpatient antibiotic stewardship, implementing the elements requires a thoughtful and consistent effort to achieve desired outcomes. This includes developing strategies and preparing individuals, facilities, or organizations for change; developing and testing stewardship interventions; identifying and addressing barriers to change; and evaluating progress toward stated goals. Outpatient settings remain a crucial component of antibiotic stewardship in the United States. Establishing effective antibiotic stewardship interventions can protect patients and optimize clinical outcomes in outpatient health care settings.

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All Women Count! Breast and Cervical Cancer Screening for South Dakota Women

In South Dakota, female breast cancer is the second leading cause of death among women, with approximately 715 new cases diagnosed and 108 women dying from breast cancer in 2013.[1] In the same year, South Dakota's incidence rate ranked the second highest in the nation (age-adjusted incidence rate: 146.1 vs. 123.7, respectively).[2]

Early detection of breast cancer through mammography and clinical breast exams (CBE) increases the chances of treatment success and prognosis, therefore reducing mortality rates.[3]

Aiming for early detection and reduction in mortality rates among the most vulnerable populations, low income, uninsured and underinsured, the National Breast and Cervical Cancer Early Detection Program (NBCCEDP) was created in response to the Breast and Cervical Cancer Mortality Act of 1990 (Public Law 101-354).[4] In South Dakota, the NBCCEDP has provided funding for the All Women Count! (AWC!) Program since 1997. The program provides breast and cervical cancer screening services at no cost to underserved women. AWC! works with over 200 provider sites across South Dakota.[5]

Breast and cervical cancer screenings are offered to women 30-64. Women younger than 40 years old require prior authorization for mammograms. Additional eligibility criteria include being uninsured or underinsured and with family income at or below the 200% federal poverty level. The following analysis is based on women paid 100% by the CDC-funded AWC! Program.

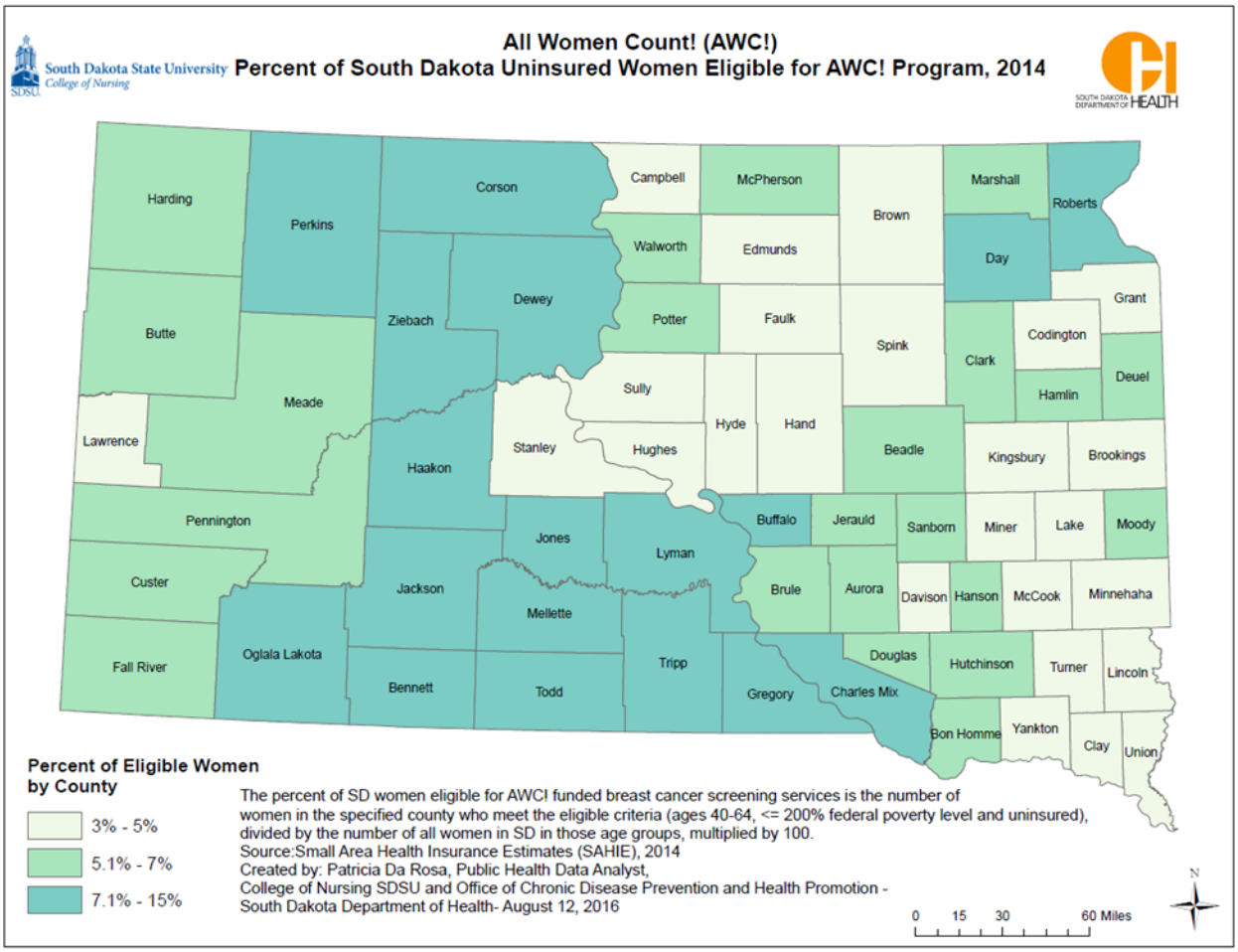


Figure 1. Percent of South Dakota Uninsured Women Eligible for AWC! Program by County in 2014

AWC! Eligibility

In South Dakota, there are approximately 131,172 women ages 40-64. Among those, the estimated number of women uninsured and with family income at or below the 200% federal poverty level is 7,205 (5.5%).[6] Aiming to identify areas with the highest percentage of women eligible for the AWC! Program, a map showing the

percentage of women ages 40-64 who are eligible for the AWC! Program by county-level was created (Figure 1). Data was calculated using 2014 Small Area Health Insurance Estimate data to determine the percent of South Dakota women eligible for the AWC! Program. The percent eligible is the number of women in the specified county who meet the eligibility criteria (ages 40-64, <= 200% federal poverty level and uninsured), divided by the number of all women ages 40-64 in the specified county, multiplied by 100. The map shows a variation (3%-15%) across counties in the distribution of low income and uninsured women. Among counties, the five with the highest number of women eligible were: Jackson (15.1%), Buffalo (14.4%), Ziebach (14.0%), Dewey (13.8%), and Corson (13.5%). The lowest percent eligible is found in Lincoln (2.6%), Union (2.8%), Lake, Hughes (3.7%) and Brookings (4.1%). This information aids in future efforts toward resource allocation, monitoring and program evaluation.

AWC! Women Served and Demographics

From 2001-2015, the AWC! Program served 21,373 women in South Dakota. Figure 2 shows trends in the number of breast cancer screening services received by women in the All Women Count! Program from 2001-2015. From 2001 to 2010, an increase in the number of clinical breast exams (CBEs) was observed, in addition to an increase in the number of mammograms from 2001-2009. It is noted however, a steady decrease from 2012-2015 in the number of CBEs and mammograms.

Figure 2. Number of women served through the AWC! by year. Each category includes unduplicated women receiving breast screening services within the 15-year period.

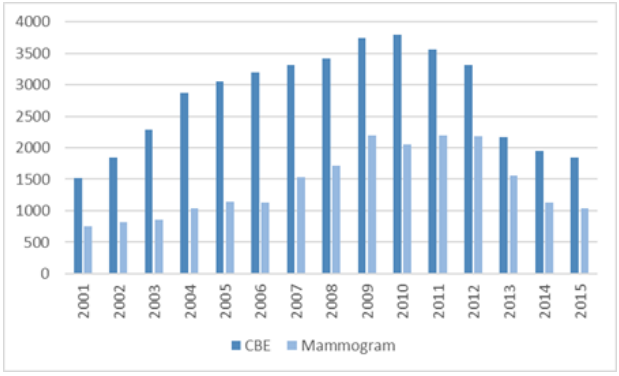


Figure 3. Percentage of women receiving breast screening through AWC! Program by race and ethnicity from January 2001 to December 2015 (N=21,373).

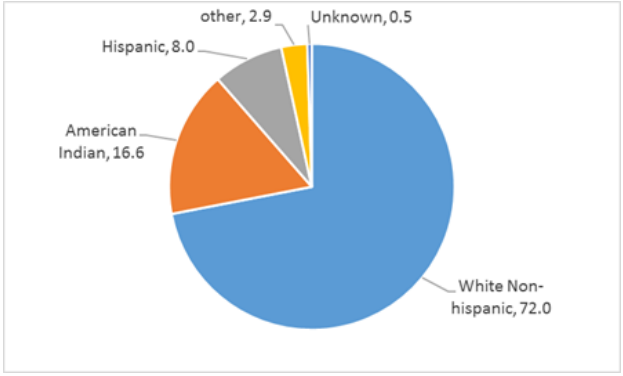
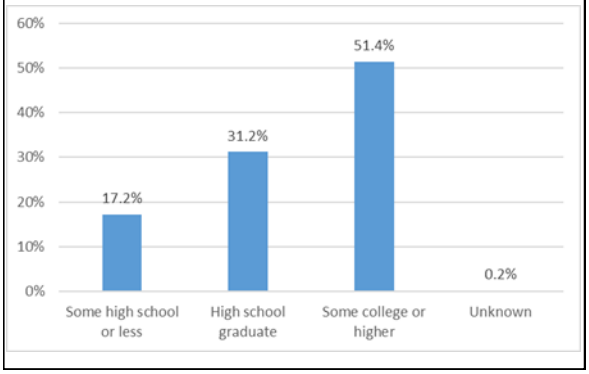


Figure 3 illustrates the percentage of women served in the AWC! Program by race and ethnicity, of which a majority of women screened were white, 16.6% were American Indian, followed by Hispanics (8.0%), other (2.9%) (e.g., Asian and Black/African American) and unknown (0.5%).

According to the data shown in Figure 4, 51.4% of the participants reported having some college or higher degree as their highest level of education. Women with a high school degree accounted for 31.2% followed by some high school or less (17.2%).

Figure 4. Highest level of education among women receiving breast screening through AWC! Program from January 2001 to December 2015



AWC! Breast Cancer Screening

From 2001-2015, the AWC! Program provided 41,899 CBE and 21,319 mammograms. Regarding the results of the initial mammograms, 15.5% were reported as abnormal (all ages). In addition, 313 breast cancers were detected, resulting in a breast cancer detection rate of 14.6 per 1,000 mammograms (Table 1).

Figure 5 illustrates the distribution of breast cancer by 5-year age groups among women 40-64. Among the 281 cancers detected, the majority of the cases detected were invasive breast cancer. Combining all cancers categories, a high number were detected among women aged 50-64 (66.9%), followed by 33.1% among women 40-49 years old.

Figure 5. Percentage of breast cancer diagnosed by the AWC! Program by 5-year age group (ages 40-64) from January 2001 to December 2015

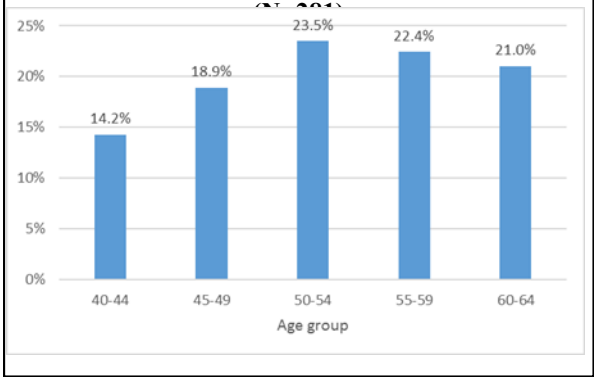


Figure 6 shows trends in the number of all breast cancers detected through the AWC! Program over the 15 years. Although the numbers were stable over the first 5 years, a considerable increase in the number of breast cancers diagnosed through the program was observed from 2005 to 2009 and from 2011 to 2013. An increase by 130% in the number of breast cancer diagnosed throughout AWC! has been observed from 2001-2015.

Figure 6. Number of all breast cancers diagnosed among AWC! participants between January 2001 to December 2015 (N=313)

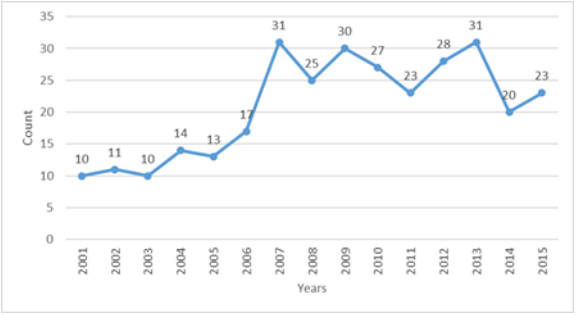


Table 1. Breast results and outcomes among women receiving breast cancer screening services through the AWC! Program between January 2001 to December 2015

Category	Number
CBE provided	41,899
CBE with abnormal results	1,530
Mammograms provided (all ages)	21,319
Mammograms provided (40-64)	20,004
Mammograms with abnormal results (all ages) [(1)]	3,302
Mammograms with abnormal results (40-64)	2,930
Percentage of mammograms with abnormal results (all ages)	15.5
Percentage of mammograms with abnormal results (40-64)	14.6
Breast Cancer detected (all ages)[)]	313
Invasive breast cancer	202
Lobular carcinoma in situ (LCIS)	9
Ductal carcinoma in situ (DCIS)	102
Breast cancer detected (40-64)	281
Invasive breast cancer	178
Lobular carcinoma in situ (LCIS)	8
Ductal carcinoma in situ (DCIS)	95
Rate of breast cancer detected per 1,000 mammograms	14.6

(1) Abnormals include mammogram results of: assessment incomplete (further imaging studies or film comparisons required), suspicious abnormality and highly suggestive of malignancy.

CONCLUSIONS

This report shows the importance of the current efforts to reach and screen low-income, uninsured and underinsured women in South Dakota. Over the past 15 years, more than 21,300 women have been enrolled in the program and 313 cases of breast cancer have been detected. However, a considerable decrease in the number of mammograms and clinical breast exams has been observed since 2012. Thus, new approaches and efforts to identify women who are eligible to be screened are needed. Physicians and other health care professionals have an important role in recommending mammography, and healthcare facilities can support these efforts by enrolling eligible women into the AWC! Program.

References:

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5.South Dakota Department of Health. All Women Count! 2016 [Available from: https://getscreened.sd.gov/count/]

6. U.S. Census Bureau, Small Area Health Insurance Estimates. [Available from: http://www.census.gov/did/www/sahie/data/interactive/sahie.html]

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South Dakota Strategic Plan 2015-2020—Suicide

Reduce the suicide age-adjusted death rate for South Dakota from 17.1 per 100,000 in 2014 to 12.6 per 100,000 by 2020

South Dakota Percent	South Dakota 2020 Target	U.S. Percent
20.4 *(2015)*	12.6	13.0 *(2014)*

Significance:
Suicide is a serious public health problem that can have lasting harmful effects on individuals, families, and communities. While the causes of suicide are complex and determined by multiple factors, the goal of suicide prevention is to reduce factors that increase risk and increase factors that promote resilience. Ideally, prevention addresses all levels of influence: individual, relationship, community, and societal. Effective prevention strategies are needed to promote awareness of suicide and encourage a commitment to social change.

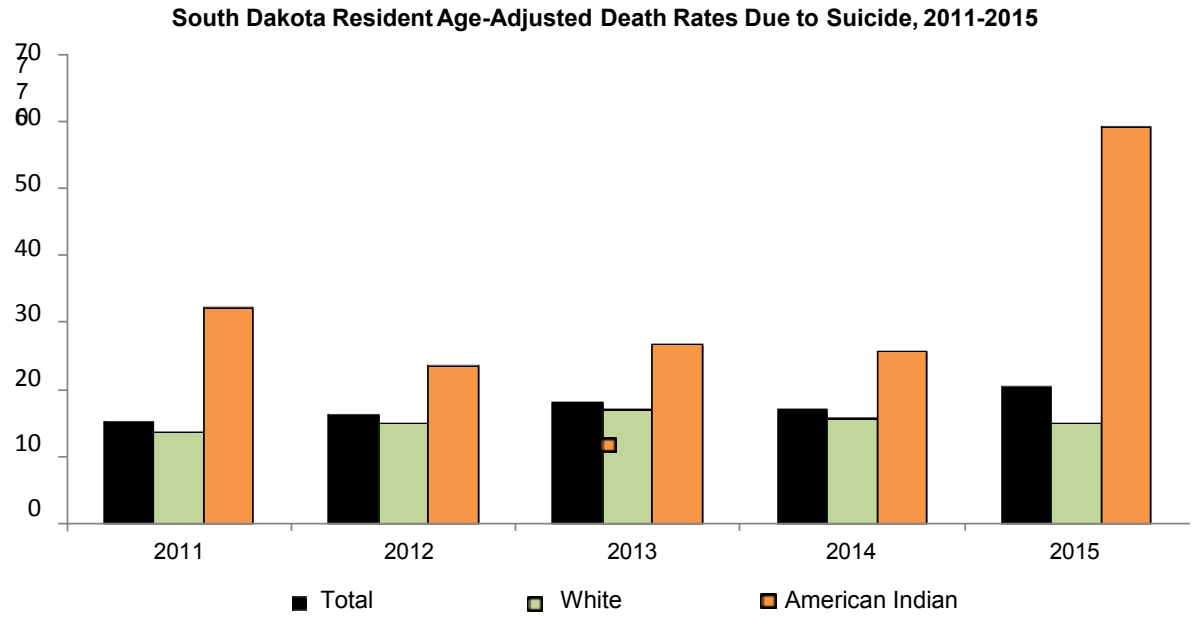
A combination of individual, relational, community, and societal factors contribute to the risk of suicide. Risk factors are those characteristics associated with suicide – they may or may not be direct causes – and may include family history of suicide, family history of child abuse/neglect, previous suicide attempts, history of mental health disorder, alcohol/substance abuse, local epidemics of suicide, loss (relationship, financial, job), etc.

Suicide was the ninth leading cause of death in South Dakota in 2015 with 173 deaths. Suicide was the second leading cause of death for residents ages 10-34 accounting for 80 deaths in 2015. Among the American Indian population, suicide was tied for the sixth leading cause of death with 48 deaths in 2015.

Definition: Age-adjusted death rate due to suicide per 100,000 population.

Data Source: South Dakota Vital Records Data

Statistical Trend:



Date Last Updated: 10/13/2016

For more information see the Department of Health's strategic plan website at http://doh.sd.gov/strategicplan/.

South Dakota Department of Health – Infectious Disease Surveillance

Selected Morbidity Report, 1 January – 31 December 2016

(provisional numbers) see http://doh.sd.gov/statistics/surveillance/

	Disease	2016 year-to-date	5-year median	Percent change
Vaccine-Preventable Diseases	Diphtheria	0	0	n/a
	Tetanus	0	0	n/a
	Pertussis	15	67	-78%
	Poliomyelitis	0	0	n/a
	Measles	0	0	n/a
	Mumps	2	0	n/a
	Rubella	0	0	n/a
	Haemophilus influenza type b	19	0	n/a
Sexually Transmitted Infections and Blood-borne Diseases	HIV infection	49	29	+69%
	Hepatitis B, acute	2	2	0%
	Chlamydia	4,336	3,724	+16%
	Gonorrhea	1,240	788	+57%
	Syphilis, early	41	47	-13%
Tuberculosis	Tuberculosis	12	15	-20%
Invasive Bacterial Disease	Meningococcal, invasive	1	2	+50%
	Strep. Pneumo., invasive	129	98	+32%
Enteric Diseases	*E. coli*, Shiga toxin-producing	80	42	+90%
	Campylobacteriosis	450	301	+50%
	Salmonellosis	300	170	+76%
	Shigellosis	27	190	-86%
	Giardiasis	114	129	-12%
	Cryptosporidiosis	157	151	+4%
	Hepatitis A	1	2	n/a
Vector-borne Diseases	Animal Rabies	27	29	-7%
	Tularemia	14	7	+100%
	Rocky Mountain Spotted Fever	6	2	+200%
	Malaria (imported)	4	5	-20%
	Hantavirus Pulmonary Syndrome	0	0	0%
	Lyme disease	11	4	+175%
	West Nile Virus disease	151	57	+165%
Other Diseases	Legionellosis	9	9	0%
	Zika	2	0	n/a
	Additional reports include: Chicken Pox (32); Coccidioidomycosis (4); CRE (43); Cyclosporiasis (3); Dengue fever (1); Ehrlichiosis (1); Hep B, chronic (52); Hep C (706); MRSA, invasive (144); Q fever (4); Toxic Shock Syndrome (1); Typhoid (2).			

Communicable diseases are obligatorily reportable by physicians, hospitals, laboratories, and institutions. The **Reportable Diseases List** is found at http://doh.sd.gov/diseases/infectious/reporting-communicable-diseases.aspx or upon request. Diseases are reportable by telephone, fax, mail, website, or courier.

Secure website: www.state.sd.us/doh/diseasereport

Telephones: 24 hour answering device 1-800-592-1804; for a live person at any time call 1-800-592-1861; after hours emergency 605-280-4810.

Fax 605-773-5509.

Mail in a sealed envelope addressed to the DOH, Office of Disease Prevention, 615 E. 4th Street, Pierre, SD 57501, marked "Confidential Medical Report".

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