



Wisconsin Household Pharmaceutical Waste Collection

Challenges and Opportunities

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UW
Extension
Cooperative Extension



*Prepared by:
The University of Wisconsin Extension with the
Product Stewardship Institute, Inc. for the
Wisconsin Department of Natural Resources*



The University of Wisconsin Cooperative Extension

Since 1990 the Solid & Hazardous Waste Education Center (SHWEC) has worked to improve Wisconsin's environment and economy by providing quality environmental education, information and technical assistance to promote the protection and sustainable use of natural resources throughout Wisconsin.

As part of UW-Extension, SHWEC works with business and community leaders to exploit the economic and environmental benefits of increased efficiency in materials and energy use. This broad area includes recycling and residuals management, energy efficiency and green design, pollution prevention, resource conservation and bioenergy development. SHWEC technical assistance and educational programming that enables communities and businesses to maximize the triple bottom line; achieving economic, social, and environmental success through the implementation of sustainable practices and improved management.

For more information, visit UW-Extension at www.uwex.edu/ or the Solid and Hazardous Waste Education Center at www4.uwm.edu/shwec/.



The Product Stewardship Institute

The Product Stewardship Institute (PSI) is a national nonprofit organization dedicated to reducing the health and environmental impacts of consumer products. PSI brings together key stakeholders with conflicting interests to develop product end-of-life solutions in a collaborative manner, with a focus on having manufacturers assume primary financial and managerial responsibility. With a robust membership base of 47 state governments and over 200 local governments, as well as partnerships with more than 75 companies, organizations, universities, and non-U.S. governments, PSI advances both voluntary programs and legislation to promote industry-led product stewardship initiatives. For more information, visit PSI online at www.productstewardship.us. You can also follow PSI on Twitter at twitter.com/ProductSteward and on Facebook at facebook.com/ProductStewardship.

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TABLE OF CONTENTS

TABLE OF CONTENTS.....	III
TABLE OF FIGURES	IV
EXECUTIVE SUMMARY	V
I. INTRODUCTION.....	1
II. EXISTING TAKE BACK PROGRAMS IN WISCONSIN.....	2
One-Day Collection Programs	2
Permanent Collection Programs.....	2
Mail-Back Collection Programs	3
III. PHARMACEUTICAL DESTRUCTION OPTIONS USED IN WISCONSIN	3
In-State Options.....	4
Out-of-State Options	4
IV. COLLECTION RATES.....	5
Unwanted Pharmaceuticals Collected in Wisconsin	5
Unwanted Pharmaceuticals Available for Collection in Wisconsin.....	5
Collection Rate	6
V. COST OF TAKE-BACK PROGRAMS	6
Total Documented Program Costs.....	6
Get the Meds Out! Mail-Back Program	6
Program Costs by Cost Category	7
VI. TRENDS IN EXISTING WISCONSIN TAKE-BACK PROGRAMS	9
Increased Amounts of Collected Unwanted Pharmaceuticals	9
Increased Number of Collection Programs and Locations	10
Preference for Permanent Collections.....	12
VII. BARRIERS TO INCREASED COLLECTION.....	13
Regulatory Hurdles	13
Lack of Sustainable Funding.....	13
Limited Capacity for In-State Destruction of Pharmaceuticals	13
Inconvenience	14
Low Levels of Public Awareness	14
VIII. ALTERNATIVE OPTIONS.....	14
Pharmaceutical Collection	14
Funding	15
Disposal and Destruction	16
Education	17
IX. OPPORTUNITIES TO IMPROVE FUTURE ESTIMATES.....	17
X. OPPORTUNITIES FOR BUSINESS DEVELOPMENT	18
XI. CONCLUSION	19
XII. APPENDICES	21
Appendix A: Definitions, Terms and Abbreviations	21
Appendix B: 2011-12 UW-Extension Study Questionnaire	24
Appendix C: List of Surveyed Locations in UW-Extension Study.....	25
Appendix D: Collection Trends in Wisconsin.....	28
Appendix E: Pharmaceutical Sales in Wisconsin	33
Appendix F: Estimated Percentage of Medications That Go Unused.....	36
Appendix G: Conversion Methodology Used to Calculate the Collection Rate	39
Appendix H: Collection Costs	42
Appendix I: Educational Flier Distributed by Wisconsin Pharmacies	47
Appendix J: An Option for Wisconsin Take-Back Collection Data Reporting	48
Appendix K: Alternatives for Disposal, Collection, Funding, and Public Education	52
ENDNOTES.....	58

TABLE OF FIGURES

FIGURE 1: MAP SHOWING 155 PERMANENT COLLECTION LOCATIONS IN WISCONSIN, UPDATED SEPTEMBER 2012.	2
FIGURE 2: LOCATIONS WHICH DISTRIBUTED <i>GET THE MEDS OUT!</i> MAIL-BACK ENVELOPES.	3
FIGURE 3: FROM THE UW-EXTENSION STUDY, THE PERCENTAGE OF UNWANTED PHARMACEUTICALS COLLECTED BY EACH PROGRAM TYPE IN 2011.	5
FIGURE 4. COMPARISON OF PER CAPITA COLLECTION RATES AND PER POUND COSTS AMONG THREE PROGRAMS.	7
FIGURE 5. FROM THE UW-EXTENSION STUDY, THE ESTIMATED COSTS OF ONE-DAY AND PERMANENT UNWANTED PHARMACEUTICAL TAKE-BACK PROGRAMS BY COST CATEGORY FOR 2010 AND 2011.	8
FIGURE 6. FROM THE UW-EXTENSION STUDY, SHOWING THE OVERALL INCREASE IN THE AMOUNT OF UNWANTED MEDICATIONS COLLECTED BY THE THREE PROGRAM TYPES IN 2010 AND 2011.	9
FIGURE 7. FROM THE UW-EXTENSION STUDY, SHOWING THE OVERALL INCREASE IN THE AMOUNT OF UNWANTED MEDICATIONS COLLECTED BY SUBSTANCE TYPE IN 2010 AND 2011.	10
FIGURE 8. FROM THE UW-EXTENSION STUDY, THE INCREASE IN THE NUMBER OF PERMANENT COLLECTION LOCATIONS AND IN THE NUMBER OF WISCONSIN COUNTIES SERVED BY THOSE PERMANENT LOCATIONS FROM 2010 TO 2012.	10
FIGURE 9. FROM THE UW-EXTENSION STUDY, THE INCREASE IN THE NUMBER OF ONE-DAY COLLECTION LOCATIONS AND IN THE NUMBER OF COUNTIES SERVED BY THOSE ONE-DAY LOCATIONS IN WISCONSIN FROM 2010 TO 2012.	11
FIGURE 10. FROM THE UW-EXTENSION STUDY, THE INCREASE IN THE TOTAL NUMBER OF UNWANTED PHARMACEUTICAL COLLECTION LOCATIONS AND IN THE NUMBER OF COUNTIES SERVED IN WISCONSIN FROM 2010 TO 2012.	11

EXECUTIVE SUMMARY

The improper storage and disposal of unwanted or unused household pharmaceuticals in the State of Wisconsin poses many health, safety and environmental risks—including drug abuse, accidental poisoning and water pollution. While household take-back programs aim to reduce these risks by providing healthier, safer alternatives to landfill and sewer disposal methods, the Wisconsin Department of Natural Resources (DNR) has determined that additional data are needed to better understand the costs, benefits, opportunities and challenges of such programs.

Compiled and written by the University of Wisconsin-Extension and the Product Stewardship Institute, this report provides an in-depth look at total current sales of household pharmaceuticals in Wisconsin and the rate at which those pharmaceuticals are wasted. The report then assesses current take-back programs, identifies barriers to higher collection rates, and explores potential alternatives for pharmaceutical destruction, program funding, collection and outreach.

Key findings of the report include:

- An estimated 118.8 million prescription and over-the-counter (OTC) medicines—approximately 13.1 million pounds—were dispensed and sold in Wisconsin in 2010.
- An estimated 4.38 million pounds went unused due to expiration and/or discontinuation of use.
- Approximately 93,500 pounds of household pharmaceuticals (or roughly 2 percent of the 2010 total) were safely collected via take-back programs in Wisconsin in 2011. The remaining pharmaceuticals were discarded in the trash, flushed down the drain, abused, or stored indefinitely in the medicine cabinet.
- Total costs for pharmaceutical take-back programs in Wisconsin in 2011 were approximately \$276,000; however, not all costs were reported.
- Based on a subset of reliable data, the estimated total cost of Wisconsin take-back programs, including donations, labor value and disposal costs, ranges between \$8.05 and \$10.07 per pound, or \$0.13 to \$0.17 per capita. These programs are funded primarily through municipal tax revenues and grants. By comparison, producer-managed programs in Canada and France average \$3.50 per pound and \$0.23 per pound, respectively.

WHY WORRY?

The improper storage and disposal of unwanted or unused household pharmaceuticals poses many health, safety, and environmental risks, a few of which include:

- *Drug Abuse*
- *Accidental Poisoning*
- *Water Pollution*

- Barriers to effective waste pharmaceutical collection programs include high costs, lack of sustainable funding, consumer inconvenience, government regulation of controlled substances, limited in-state capacity for pharmaceutical destruction, inadequate program promotion, and low public awareness.

As currently operated, pharmaceutical waste collection programs in Wisconsin are not sustainable. Inadequate funding and regulatory red tape, combined with program inconvenience and lack of public awareness, result in less than optimal collection rates. To boost the success rate and increase the longevity of the state's current pharmaceutical waste collection programs, it is recommended that Wisconsin explore alternative solutions. These might include the set-up of universal pharmaceutical waste drop-off locations that consumers can use freely and easily access; the widespread promotion of the collection programs and their benefits; additional research to monitor and evaluate waste generation and collection rates; the securing of consistent funding from a reliable source; and the adoption of regulatory changes that facilitate waste transportation, reduce costs and promote more waste collection. Such enhancements would also spawn new opportunities for business development in Wisconsin, such as waste hauling, in-state pharmaceutical destruction and increased patronage at local pharmacies.

I. INTRODUCTION

Every year across the U.S., prescription and over-the-counter drugs of all types from cold and flu elixirs to narcotic painkillers and weight control pills are manufactured, marketed, prescribed, dispensed and discarded at extraordinary rates. Most often, this phenomenon leads to the steady accumulation of medicines in the household, which puts human and animal health at risk of accidental ingestion, overdose, or abuse. In fact, unintentional prescription opioid overdoses now kill more Americans than cocaine and heroin combined.ⁱ If drugs are disposed of, they are usually flushed down the drain or thrown out with the household trash—both of which may lead to water contamination and environmental toxicity.

While no studies to date have demonstrated ill effects on human health from long-term exposure to trace amounts of active pharmaceutical ingredients, studies have found pharmaceuticals present in some ecosystems at levels likely to harm entire populations of aquatic organisms.ⁱⁱ A U.S. Geological Survey, conducted from 1999-2000, found that 80 percent of streams tested were contaminated with at least one pharmaceutical, personal care product, or other organic wastewater contaminant.ⁱⁱⁱ Studies specific to the Great Lakes Region have also found pharmaceuticals in source drinking water. These include studies by the City of Milwaukee^{iv}, Illinois EPA in 2008^v; Lake County, Illinois in 2008^{vi}; Erie, Pennsylvania in 2008^{vii}; and a Michigan study that found pharmaceuticals in the source waters for the municipal water supplies for Ann Arbor (Huron River), Grand Rapids (Lake Michigan), and Monroe (Lake Erie).^{viii}



In Wisconsin, it is estimated that over 13 million pounds of pharmaceuticals are sold each year, and roughly one-third of all doses prescribed go unused.¹ To attempt to combat the growing problem of improper storage and disposal of pharmaceuticals, communities throughout Wisconsin have created and implemented voluntary household drug take-back programs.

The Wisconsin DNR commissioned this study to better understand the scope and impact of existing household pharmaceutical waste collection programs in Wisconsin and the degree to which current programs are effectively addressing the issue. Data collected as part of the study helped establish a baseline waste collection rate for Wisconsin, against which future programs can be measured.

Additionally, this study attempts to reveal the costs associated with current take-back program efforts and to compare those costs to alternative options for collection and disposal. This may help identify more efficient program models that reduce costs. Finally, this study explores opportunities for business development and increased economic activity by increasing the collection of waste pharmaceuticals through both new and existing programs.

A list of terms and definitions used throughout this study can be found in Appendix A.

¹ For more information, see Appendix F.

II. EXISTING TAKE BACK PROGRAMS IN WISCONSIN

In Wisconsin, voluntary household pharmaceutical take-back programs consist of three types: one-day, permanent, and mail-back. A list of existing collections in Wisconsin can be found at <http://shwec.uwm.edu/collections>. The three collection types are described below.

One-Day Collection Programs

One-day collection programs offer residents the opportunity to drop off their unwanted medications at a specific place and time. These collections vary quite a bit in their operation, but usually take place once or twice a year, during which time drugs are collected for a few hours, usually on a weekend.

One-day programs require advance planning, advertising, a publicly accessible location, and labor for various tasks. Labor can be paid or voluntary, and often includes sorting drugs into controlled and non-controlled substances categories. Per federal regulations about the handling of controlled substances, a law enforcement official must be present at the collection site for the program to be able to accept controlled substances. Examples of major one-day collection programs in Wisconsin are the biannual National Take Back Events, funded by the Drug Enforcement Administration (DEA), and the Milwaukee Metropolitan Sewerage District Medicine Collection Day.

Permanent Collection Programs

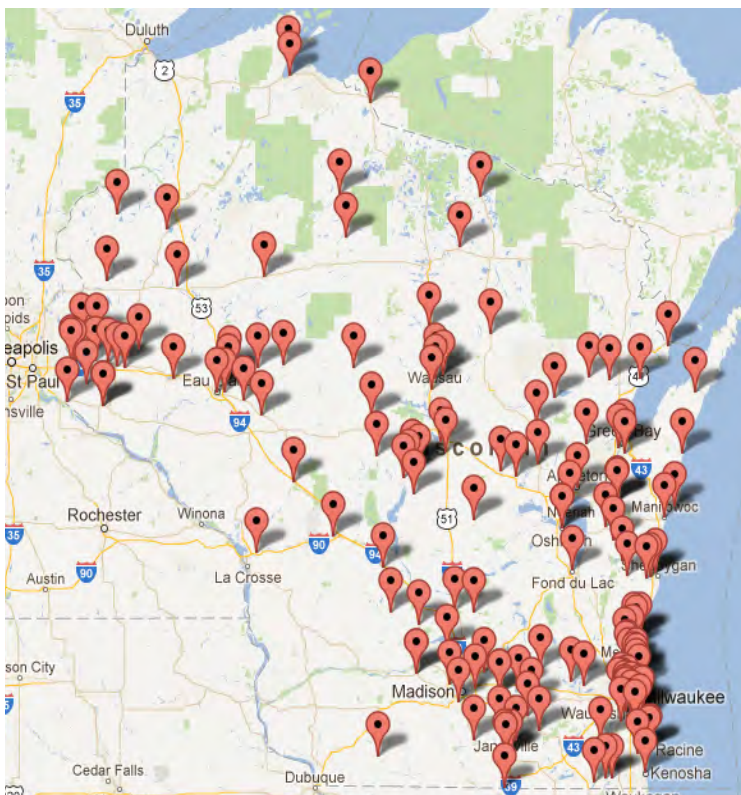


Figure 1: Map showing 155 Permanent Collection Locations in Wisconsin, updated September 2012.

Permanent collection programs provide residents with year-round access to drop-off locations. In Wisconsin, these are primarily located at local police and sheriff's departments and, occasionally, at a pharmacy or clinic. Like one-day collections, permanent locations vary a bit in their operation. Some locations have a drop box available to the public all day, every day; others have a box available during business hours. At permanent locations without a drop box, drugs must be given directly to a law enforcement official. The emptying of the drop box and sorting drugs is often incorporated into routine law enforcement duties, although sometimes pharmacists or nurses volunteer to help with the latter.

The use of permanent drug collection locations in Wisconsin has been growing rapidly in recent years.²

² See Section VII: Trends in Existing Wisconsin Take Back Programs for more information.

Mail-Back Collection Programs

Mail-back programs provide residents with pre-addressed envelopes in which to ship their unwanted medications to an approved disposal agency. In 2011, the University of Wisconsin-



Extension launched a pilot mail-back program called *Get the Meds Out!*. Offered at nearly 350 pharmacies, clinics, health departments, senior citizens centers and police departments in the 36 Wisconsin counties that drain into the Great Lakes watershed, *Get the Meds Out!* offered residents mail-back envelopes at no cost for four months. The envelopes were addressed to the Maine Drug Enforcement Administration, which safely collected and disposed of both controlled and non-controlled substances. The pilot was funded through the U.S. Environmental Protection Agency under a Great Lakes Restoration Initiative (GLRI) grant.

Figure 2: Locations that distributed Get out the Meds Out mail-back envelopes

III. PHARMACEUTICAL DESTRUCTION OPTIONS USED IN WISCONSIN

To minimize environmental impacts, the EPA recommends that pharmaceuticals collected by take-back programs be destroyed by high temperature incineration in an approved hazardous waste combustor. When this is not feasible, the EPA recommends that, at minimum, pharmaceuticals be burned in a large or small municipal waste combustor.^{ix}

In-State Options

The Wisconsin DNR requires that collected household pharmaceuticals be incinerated in facilities according to their state and federal air permits.^x Although Wisconsin has no licensed hazardous waste or medical waste incinerators, it does have a number of industrial boilers and two municipal solid waste combustors that could potentially be used for pharmaceutical destruction. Only one such facility, a coal-fired power plant in Green Bay, has asked the DNR to change its permit and allow it to burn up to 300 pounds of controlled substances per month on behalf of local law enforcement agencies. The DNR approved this change initially and reaffirmed it in August 2012.

Other options which destroy pharmaceutical compounds, such as burn barrels, are illegal and cause air pollution. The EPA has made it clear that the exemption allowing law enforcement agencies to burn confiscated illegal drugs, such as marijuana and cocaine, does not apply to prescription medications.

Out-of-State Options

The nearest out-of-state options for pharmaceutical destruction include waste-to-energy facilities owned by Covanta in Indiana and Minnesota, and hazardous waste incinerators owned by Veolia Environmental Services in Illinois and Texas.

There are several options for transporting waste to these out-of-state facilities:

- Municipalities may transport the waste themselves or hire a licensed waste hauler to transport it directly from their community to the facility, as long as any controlled substances are accompanied by law enforcement officers. This must be done in accordance with federal DEA regulations.
- Municipalities may work together and transport their unwanted medications to a central location, such as Jefferson County, which currently acts as an aggregation point for controlled substances in Wisconsin. They then share the cost of sending a truck and a law enforcement officer to the out-of-state facility.
- Law enforcement agencies, cooperating with the DEA as part of the *National Take-Back Initiative*, may give the drugs to the DEA, which then transports them to the Covanta incinerator in Indiana.

Another option would be for consumers to mail their drugs to an approved incinerator. During the *Get the Meds Out!* pilot mail-back program in the fall of 2011, individual households mailed their unwanted drugs to Maine, where the Maine DEA arranged for proper destruction. Similarly, national pharmacy chains Walgreens and CVS have offered a consumer mail-back program for non-controlled substances that facilitates the incineration of household medications in Texas.

IV. COLLECTION RATES

Unwanted Pharmaceuticals Collected in Wisconsin

The three types of take-back programs in Wisconsin collected an estimated 93,500 pounds of unwanted medication in 2011. This estimate was obtained from a study conducted in early 2012 by the University of Wisconsin-Extension Solid and Hazardous Waste Education Center (UW-Extension study). The study respondents included only those collections programs supported, in part or in whole, by Wisconsin municipalities. The survey data were limited by a lack of centralized state-wide information, non-response bias, variation in recorded data, and a lack of recorded data among some collection programs.^{3,4}

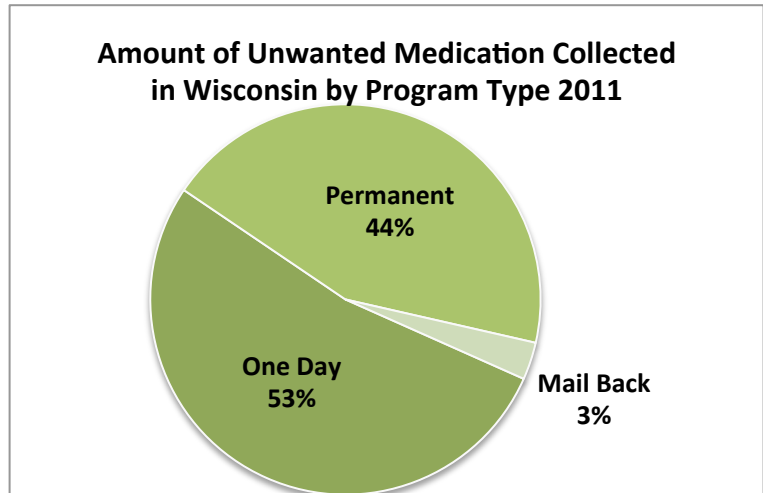


Figure 3: Percentage of unwanted pharmaceuticals collected by each program type in 2011 (UW-Extension).

Unwanted Pharmaceuticals Available for Collection in Wisconsin

The amount of unwanted pharmaceuticals available for collection is derived by estimating the percentage of pharmaceuticals sold that go unused:

$$\text{Amount available for collection} = \text{Amount sold} \times \text{Percent unused}$$

In Wisconsin, an estimated 118.8 million prescription and over-the-counter medicines were sold in 2010. Approximately 33 percent of those went unused. This results in an estimated 39.6 million household pharmaceuticals available for collection.

In order to derive these estimates, sales data were obtained from the Kaiser Family Foundation, IMS Health, the Consumer Health Care Products Association and the Nielsen Group. The estimated percentage of unused medicines is supported by data from in-home surveys conducted in the U.S. and in various foreign countries, estimates from U.S. organizations and by U.S. rates of patient adherence to prescriptions. These data are limited, however, due to assumptions about the ratio of sales between generic and brand name medications; variation in the total weight of pills versus ointments, creams, sprays, and liquids; and differences in medicine consumption and disposal rates between the U.S. and other countries.⁵

³For additional information on the amount of pharmaceuticals collected by Wisconsin municipal programs and limitations of available data, see *Section VII: Trends in Existing Wisconsin Take Back Programs* and Appendix D. A copy of the questionnaire used in the UW-Extension study can be found in Appendix B. A list of surveyed locations in Wisconsin can be found in Appendix C.

⁴ Suggestions for improving upon existing data can be found in *Section X: Opportunities to Improve Future Estimates*.

⁵ For additional information on methodology and limitations of the data, see Appendix E. Suggestions for improving upon existing data can be found in *Section X: Opportunities to Improve Future Estimates*. For more detailed information on the

Collection Rate

The rate of collection of unwanted pharmaceuticals is derived by dividing the amount of pharmaceuticals collected in a given year by the amount available for collection:

$$\frac{\text{Amount of unwanted pharmaceuticals collected}}{\text{Amount of unwanted pharmaceuticals available for collection}} = \text{Collection Rate}$$

In 2011, the amount of unwanted pharmaceuticals collected was roughly 93,500 pounds. The amount of unwanted pharmaceuticals available for collection was estimated at 118.8 million prescriptions, or 4.4 million pounds. As a result, the baseline collection rate in Wisconsin is 2 percent, which serves as a benchmark against which future program performance can be measured.⁶

III. COST OF TAKE-BACK PROGRAMS

Total Documented Program Costs

Wisconsin Permanent and One-Day Municipal Programs

To facilitate comparison with other existing programs, it was necessary to determine the average cost per pound, cost per prescription, and cost per capita for Wisconsin one-day and permanent municipal collections. The total cost for Wisconsin programs is estimated to be between \$8.05 to \$10.07 per pound, \$0.13 to \$0.17 per capita, and less than \$0.01 per prescription sold. All cost estimates for existing permanent and one-day take-back programs in Wisconsin were determined using data from the UW-Extension study⁷.

Get the Meds Out! Mail-Back Program

Costs for the research and pilot mail-back program, *Get the Meds Out!*, were \$7.80 per envelope, \$18.40 per pound, and \$1.64 per prescription. These costs were determined using data that the University of Maine provided to the University of Wisconsin Extension, which ran the program from August to December 2011. However, since *Get the Meds Out!* was primarily a research pilot, there were additional costs for data gathering, research, and analysis that would not normally be included in a standard mail-back program. Therefore, these costs should not be used to estimate the cost of a program designed purely for collection.

Foreign Programs

Currently, Wisconsin collection programs are more expensive per pound and per capita than take-back programs in France, British Columbia, and Australia. British Columbia, for example, collects twice as many pounds per capita at half the per-pound cost.^{xi} France collects 26 times the number of pounds of medicine per capita than Wisconsin programs collect, at just \$0.23 per pound.^{xii}

estimated amount of prescriptions and over-the-counter equivalents sold in Wisconsin, see Appendix E. For more detailed information on the percent of medications that go unused in Wisconsin, see Appendix F.

⁶ Details of this calculation and all accompanying assumptions, including the conversion rate between pounds and prescription equivalent units, can be found in Appendix G.

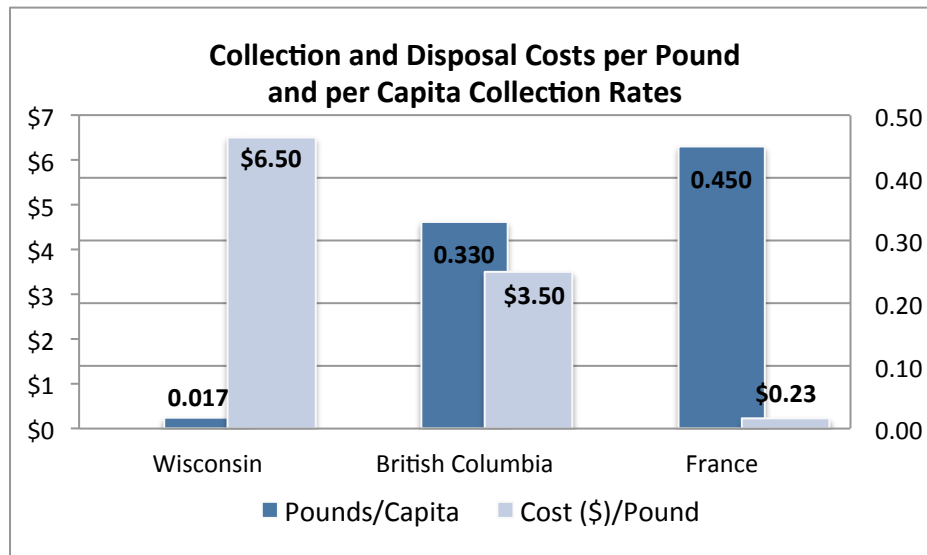
⁷ For more detail on the cost of one-day and municipal programs, see the following section, Derived Unit Costs, and Appendix H.

Costs per prescription can't be compared fairly to other programs because most programs record collections by weight. Likewise, average prescription weights in the U.S. can't be accurately converted to units of foreign medicines collected. Costs per capita are roughly the same for France and British Columbia at around \$0.10 per capita, while Wisconsin programs' per-capita cost— including the value of volunteer labor and donations—is approximately \$0.15.^{xiii}

Program Costs by Cost Category

One-Day and Permanent Collection Sites

The UW-Extension study of permanent and one-day municipal take-back programs categorized costs into the following groups: program operation; drug disposal; estimated value of donations and volunteer labor; and, for permanent collections, the purchase and installation of a drop box. The following estimates are presented as ranges, primarily due to the level of uncertainty in the data from the UW-Extension study. Data were obtained by surveying existing collection programs, and estimates were greatly affected by the exact operation of individual programs and by the type of collection.⁸



Wisconsin's program *operational* costs are estimated to range between \$4.30 and \$4.87 per pound, \$0.07 and \$0.08 per capita, or \$0.03 and \$0.04 per prescription sold in the state. These costs include publicity for the program, such as fliers, radio and newspaper ads, any purchased materials, and paid staff time to plan and run the event or program, including sorting drugs.

Figure 4. Comparison of per Capita Collection Rates and per Pound Costs among Three Programs (excluding Wisconsin-specific donations and volunteer labor).

Wisconsin's drug *disposal* costs are estimated to be between \$1.53 and \$2.27 per pound, \$0.03 and \$0.04 per capita, and \$0.01 and \$0.02 per prescription sold in the state. This includes the rates charged by the disposal company and some transportation of the drugs. It does not include programs with access to no-cost disposal since such options are not guaranteed to be available in the future.

Wisconsin's estimated value of *donations and volunteer labor* is \$2.22 to \$2.93 per pound. These costs equate to between \$0.04 to \$0.05 per capita and less than \$0.02 per prescription and OTC equivalent sold in the state. These costs include donated materials and volunteer time to run an event or program, including drug sorting.

⁸ For more detail on the variations in cost data, see Appendix H.

The costs to purchase and install a drop box average \$700, but can range from \$100 to \$2,000. Boxes are sometimes purchased and donated to the collection location by other local organizations.⁹

Mail-Back Programs

Another estimate for mail-back program costs may be the \$3.99 price that Walgreens and CVS charge for their consumer-financed program.^{xiv} Assuming these envelopes contain approximately a half-pound of medicine, the cost per pound would be approximately \$8.00.

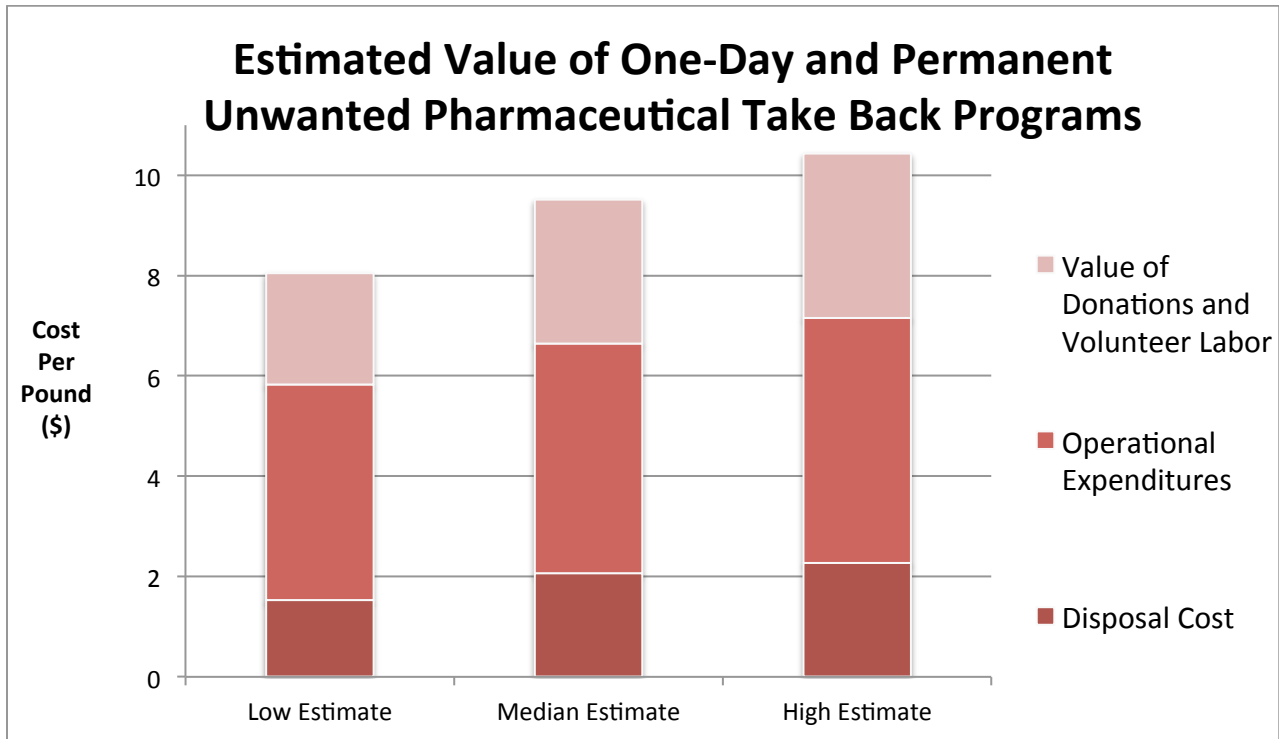


Figure 5. Estimated costs of one-day and permanent unwanted pharmaceutical take-back programs by cost category for 2010 and 2011 (UW-Extension).

⁹ For more detail on costs, see Appendix H. Suggestions on how to improve these estimates can be found in *Section X. Opportunities to Improve Future Estimates*.

VI. TRENDS IN EXISTING WISCONSIN TAKE-BACK PROGRAMS

Both the amount of collected unwanted pharmaceuticals and the number of collection locations have increased dramatically over the past few years in Wisconsin. Permanent collection programs have seen a particularly large increase, likely due to the simplicity, convenience, and lower perceived cost of this type of collection.

Increased Amounts of Collected Unwanted Pharmaceuticals

Between 2010 and 2011, the amount of unwanted pharmaceuticals collected by municipally operated Wisconsin take-back programs increased approximately 70 percent—from roughly 55,000 pounds to 93,500 pounds. While one-day programs saw an increase of about 9 percent (8,100 pounds), permanent

collections saw a 340 percent increase—from roughly 9,260 pounds in 2010 to an estimated 41,100 pounds in 2011. The quadrupled collection amount may be partially explained by the dramatic rise in the number of permanent collection programs throughout the state.

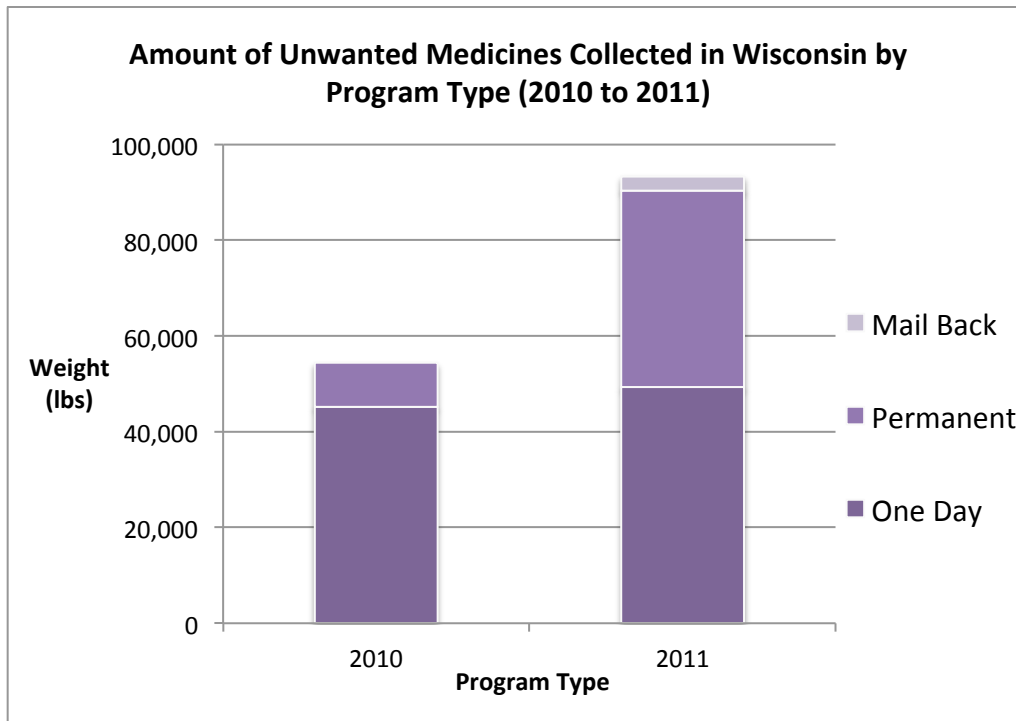


Figure 6. Overall increase in the amount of unwanted medications collected by the three program types in 2010 and 2011 (UW-Extension).

Before disposal, unwanted medications are often categorized by collection programs into controlled and non-controlled substances. In 2011, the amount of controlled substances collected increased by 108 percent from 3,683 pounds to 7,675 pounds. The amount of collected non-controlled substances remained relatively stable, increasing from 48,885 pounds to 50,257 pounds, or 2.8 percent. The amount of medicine that went uncategorized in 2011 experienced a dramatic increase of 1,336 percent from roughly 2,497 to 35,862 pounds. This surge in the amount of uncategorized drugs collected is likely a result of the increased number of Wisconsin collection locations sponsored by the DEA’s National Take Back Events, which do not require that drugs be separated before disposal.¹⁰

¹⁰ For more detailed information on the increase in amount of collected drugs in Wisconsin, see Appendix D.

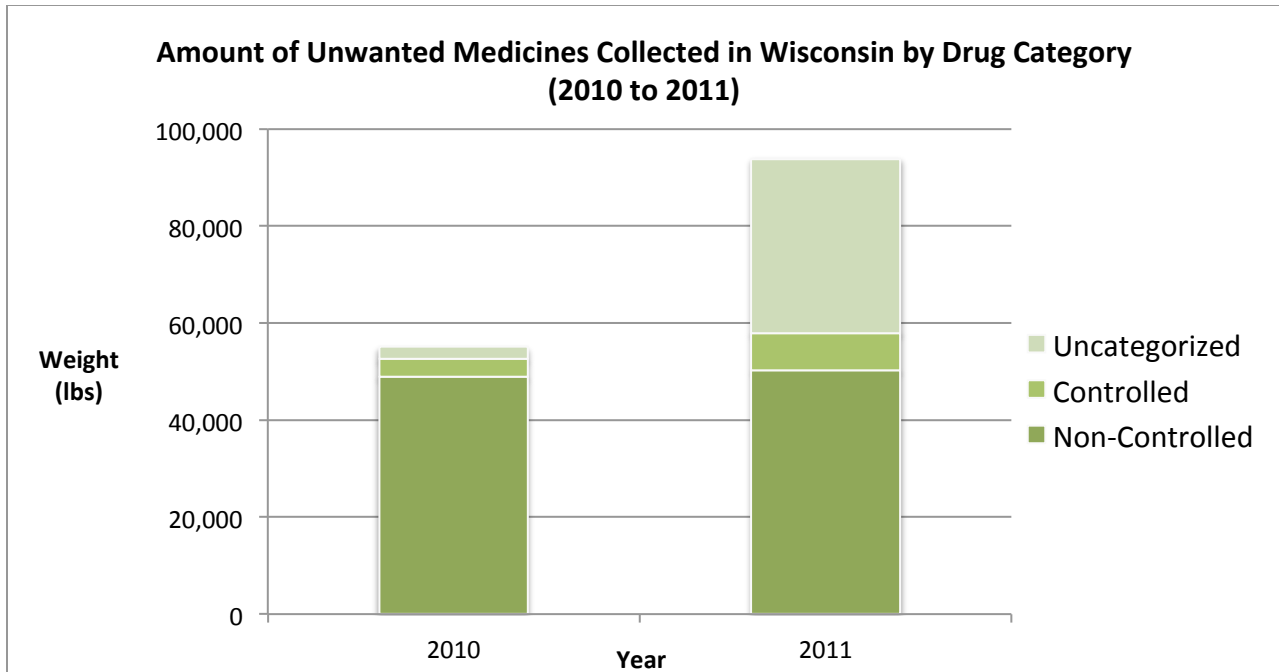


Figure 7. Overall increase in the amount of unwanted medications collected by substance type in 2010 and 2011 (UW-Extension).

Increased Number of Collection Programs and Locations

The number of both one-day and permanent collection locations grew steadily from 2010 to 2011, and continues to grow in 2012. Prior to 2010, there were only five permanent locations. By September 2012, however, 162 permanent locations had opened in 52 of Wisconsin’s 72 counties.

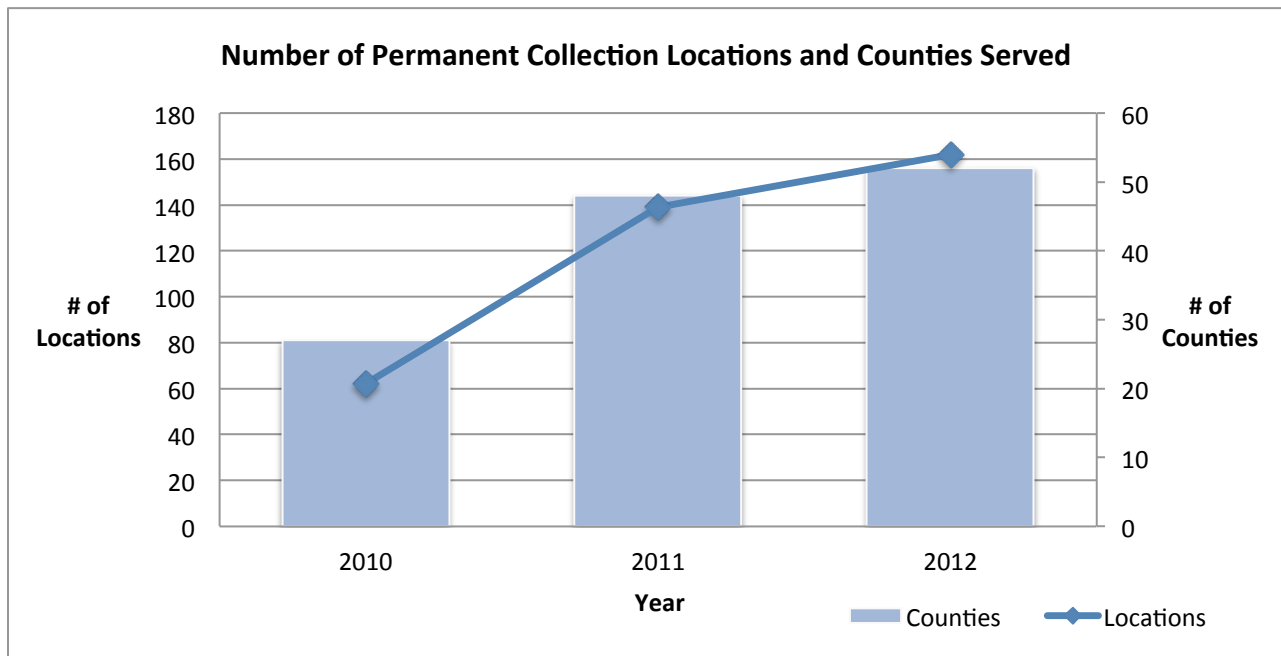


Figure 8. Increase in the number of permanent collection locations and in the number of Wisconsin counties served by those permanent locations from 2010 to 2012 (UW-Extension).

Similarly, in 2010, roughly 88 locations in 39 counties held a one-day collection; two years later, those numbers grew to at least 182 locations in 59 counties.

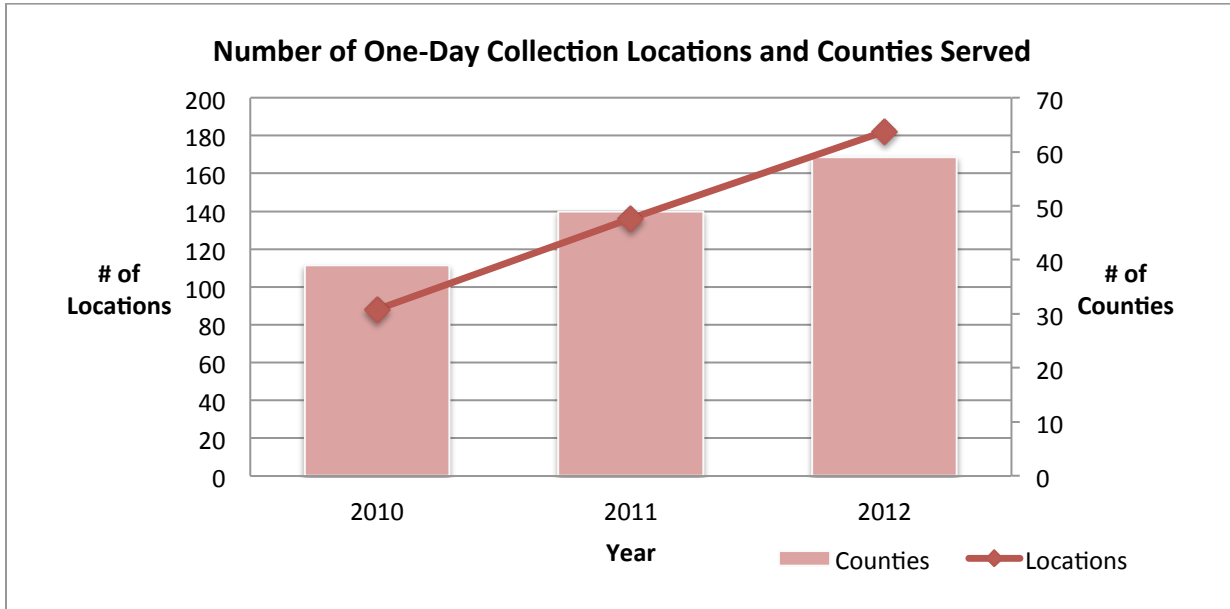


Figure 9. Increase in the number of one-day collection locations and in the number of counties served by those one-day locations in Wisconsin from 2010 to 2012 (UW-Extension).

Between 2010 and 2011, the total number of household pharmaceutical waste collection locations increased from at least 150 in 54 counties to at least 275 in 68 counties. By 2012, those numbers grew to 344 locations in 69 counties; however, they do not take into account the roughly 325 pharmacies, clinics, health departments, senior centers, and police departments in 36 Wisconsin counties that distributed envelopes for the duration of the *Get the Meds Out!* mail-back program in 2011.

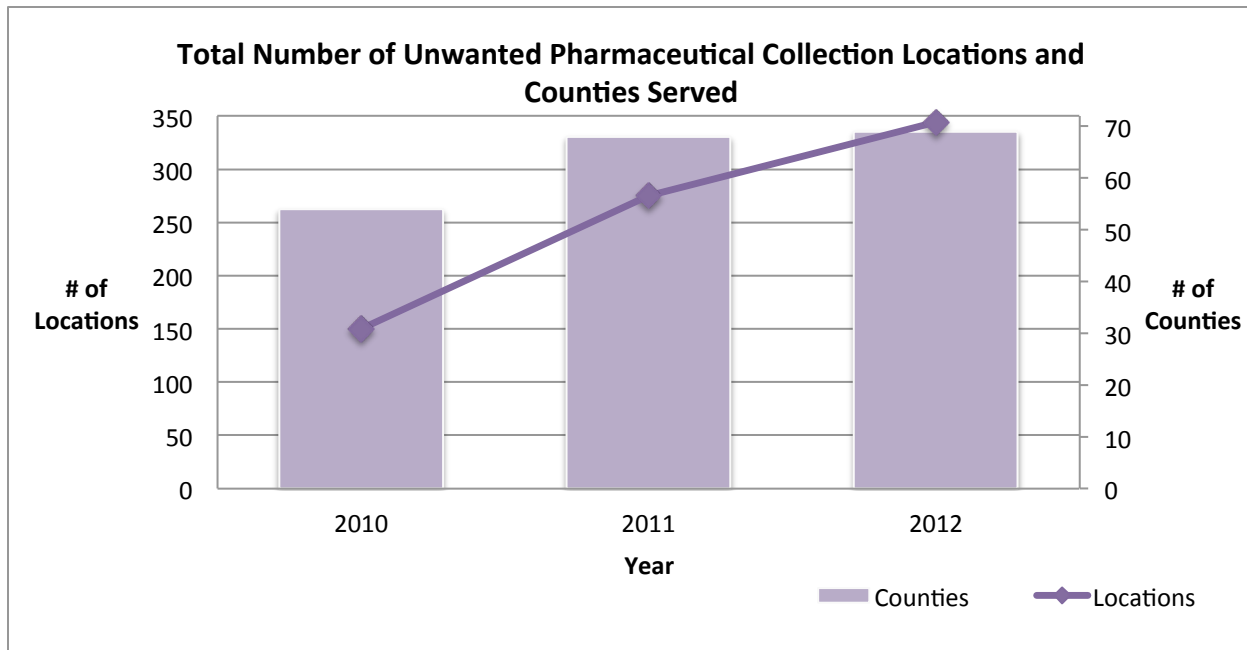


Figure 10. Increase in the total number of unwanted pharmaceutical collection locations and in the number of counties served in Wisconsin from 2010 to 2012 (UW-Extension).

Preference for Permanent Collections

In several cases, Wisconsin counties and communities now rely solely on their permanent locations, and seldom (if ever) host additional one-day events. The UW-Extension study found that the most common reasons for this shift were ease of operation, convenience for residents, and lower perceived cost of permanent collection locations. An additional benefit of permanent collections, albeit one not explicitly cited by any of the survey respondents, is the potential for reduced vehicle emissions when compared to one-day collection programs.

Ease of Operation

Permanent collection locations seem to be preferred over one-day take-back events primarily because of their simplicity. One-day collection programs require a great deal of planning, rely heavily on volunteer labor, and usually occur outside the normal hours of municipal business. Permanent locations require some initial setup if the location has a drop box, but normal operation, such as emptying the drop box and sorting drugs, is incorporated into routine business. This greatly reduces the need for volunteer labor and requires less additional planning and coordination.

The *Get the Meds Out* mail-back program required the least effort on the part of the hosting facility, who simply distributed envelopes to the public. However, this program was a research pilot and ended in December 2011.

Convenience

Permanent collection locations offer a greater level of convenience for the user than one-day take-back programs, mostly because of their consistent availability. Locations with a drop box available 24 hours a day, seven days a week offer the highest level of convenience, followed by those with a drop box available during business hours. Permanent collections without a drop box are less convenient than those with one, either having fewer collection hours available or requiring more time from law enforcement, but are still more convenient than one-day collection events.

Wisconsin permanent collections are mostly located at police and sheriffs' departments, which are unlikely to be on the normal errand-route of most residents. Consequently, although permanent collections offer a greater degree of convenience than one-day collections, they are not ideal.

The *Get the Meds Out* mail-back program offered the greatest convenience for the user, who simply placed their unwanted medicines in an envelope and sent it through the regular mail. This was the only program which offered convenience to home-bound residents.

Cost

The UW-Extension SHWEC survey found that permanent collection programs in Wisconsin were the least expensive of the three types of take-back program in 2011, costing roughly \$1.18 per pound less than one-day collections. These lower costs are primarily due to the utilization of existing staff resources to operate permanent collection programs, reducing the necessity of additional volunteers and other labor. Permanent collections located at law enforcement departments also eliminate the need to transport drugs for storage until disposal, reducing total transportation costs.

A comparable cost comparison with *Get the Meds Out!*, which was estimated to be over twice as expensive per pound as permanent collections, is not justified due to the nature of the program

as a research project. Data collection and analysis for *Get the Meds Out!* were more detailed and time-consuming, and thus more expensive, than if the program had been designed exclusively as a take-back collection.

Emissions

All take-back programs result in at least some green house gas (GHG) emissions, the bulk of which are associated with the transportation of unwanted medications, both to the collection site and to the disposal site. Though no data are available to enable a comparison of GHG emissions between Wisconsin programs, permanent locations are likely to have a lower impact on emissions associated with transportation to the collection site than one-day collections. One-day programs can require an automobile trip outside the user's normal routine, and cars often idle in line waiting to drop off their medicines. Permanent locations at or close to a high-traffic area could be visited along a user's normal errand route, reducing automobile emissions.

The *Get the Meds Out* mail-back program used the existing postal service infrastructure, significantly minimizing added green house gas emissions per pound of unwanted medication collected.

VII. BARRIERS TO INCREASED COLLECTION

Regulatory Hurdles

Regulations mandating that law enforcement be present for the collection of controlled substances reduce the flexibility and, thus, the effectiveness of take-back programs. They also increase the costs of operations and disposal. Some programs are unable to collect controlled substances due to lack of funding, lack of law enforcement cooperation, or both. Additionally, air quality regulations require expensive plan reviews for boilers and incinerators seeking permission to burn relatively small amounts of unwanted pharmaceuticals and are an obstacle to increased use of in-state facilities.

Lack of Sustainable Funding

Existing pharmaceutical collection programs in Wisconsin have been constrained by a lack of consistent and sustainable funding. The burden for funding falls on government and taxpayers, with many programs relying on government grants, private donations, and in-kind contributions. Thus, programs are sometimes canceled in years when funding is unavailable. For example, Buffalo County received Wisconsin Pharmaceutical Waste Clean Sweep grants in both 2010 and 2012, but not in 2011, and therefore was not able to hold a collection event in 2011.

Limited Capacity for In-State Destruction of Pharmaceuticals

There is limited capacity within Wisconsin for destroying unwanted pharmaceuticals. As of October 2012, none of the capacity is being used. Currently, only one Wisconsin facility, the Wisconsin Public Service (WPS) coal-fired Pulliam power plant in Green Bay, has asked the DNR to accept and burn controlled substance pharmaceuticals at an average rate of 300 pounds per month. The DNR approved the proposal and the facility burned controlled substances from local law enforcement until August, 2012, when the facility suspended this practice. WPS has indicated it would resume the practice after EPA clarifies its regulations about how burning pharmaceuticals might impact the facility's operations under forthcoming air regulations.

The Barron County municipal solid waste combustor is allowed to burn household pharmaceuticals that are discarded with other household wastes, but may not burn collected pharmaceuticals because the waste is not named in its air permit. Requesting a change in the permit could cost up to \$10,000, and so the County has been reluctant to request the change.

The Xcel Energy French Island Generating Plant, a waste-to-energy facility in La Crosse may be allowed to burn pharmaceuticals, but has not requested the state to modify its air permit to do so.

Inconvenience

Limited funding restricts the number of take-back programs available to the public and limits their frequency and hours of operation. When collection locations are not convenient, collection levels are low because fewer consumers can take advantage of the programs. For example, one-day collections are often held just once or twice per year and only for a limited number of hours. If a resident is unable to attend that event, that person must wait until the next event to drop off unwanted medications, reducing the likelihood that the medications will be safely discarded. Moreover, when programs are held in locations that are not on a resident's normal errand route, then the program is less convenient.

Low Levels of Public Awareness

Public awareness about pharmaceutical take-back programs in Wisconsin is low. This is due largely to a lack of consistent outreach, messaging, and promotion. Inconsistent messages about the proper disposal of unwanted medicines can cause confusion and consumers may retain unneeded medicines in their homes. Lack of outreach about existing programs leaves most consumers unaware that disposal options exist in their communities. Improved educational efforts and public outreach is essential to encouraging participation in take-back programs.

VIII. ALTERNATIVE OPTIONS

The most effective pharmaceutical take-back programs:

1. Do not place restrictions on the types of pharmaceuticals that can be collected, resulting in increased participation and greater quantities of collected medication.
2. Operate at no cost to consumers due to a consistent, reliable stream of funding.
3. Ensure a safe, healthful, and environmentally responsible means of discarding unwanted medicine.

Pharmaceutical Collection

Successful take-back programs are convenient for consumers to find and use, and they accept all or most of the following types of waste materials: non-controlled and controlled substances; dispensers and other devices for administering medication; and medical sharps and sharps containing medications, such as EpiPens®.

There are many programs in operation around the world that can serve as models for Wisconsin. For example, France, Sweden, and British Columbia have all implemented pharmacy-based collection programs, allowing consumers to drop off their unwanted medications while picking

up their new ones. In San Francisco, collection programs are hosted in pharmacies and police stations; for a time, the city operated a mail-back program, too, but they discontinued it due to high costs. Colorado offers residents the option of dropping off their unwanted medications at a limited number of pharmacies and health care facilities; eleven Colorado cities allow residents to dispose of non-controlled substances in drop boxes. In Illinois, drop-boxes are installed at police stations. Nationally, the chain pharmacies Walgreens and CVS offer a mail-back option, run by Sharps Compliance, which costs consumers \$3.99 per envelope; however, this program does not accept controlled substances and no data are available regarding the effectiveness of its approach.¹¹

The following chart¹² summarizes which pharmaceuticals are accepted for collection by various national and international programs:

	Sweden	British Columbia, CAN	France	Australia	San Francisco, CA	Alameda County, CA	Walgreens /CVS
Non-Controlled Substances	✓	✓	✓	✓	✓	✓	✓
Controlled Substances	✓	✓	✓	✓	✓	✓	
Medical sharps	✓						
Over-the-Counter Medicines	✓	✓	✓	✓	✓		✓
Prescription Medicines	✓	✓	✓	✓	✓	✓	✓

Funding

A sustainable pharmaceutical take-back program must have steady, sizeable funding to operate smoothly and effectively. Methods of securing funding¹³ vary from location to location, but include the following:

- **Manufacturer funding:** In France, British Columbia, Ontario, San Francisco, and Alameda County, California, pharmaceutical brand owners fund take-back programs.
- **Pharmacy funding:** In Sweden, pharmacies cover the costs of medication collection and destruction, as well as program promotion.
- **Drug possession fees:** In Illinois, the fees that law enforcement officials collect from citizens charged with drug possession are used to fund household pharmaceutical waste collections. However, these fees are inadequate and fund only a small part of Illinois take-back programs.

¹¹ For more information on collection methods for these programs, see Appendix K.

¹² For a more detailed explanation of each program, see Appendix K.

¹³ Advantages and disadvantages of various funding mechanisms are explored in greater depth in Appendix K.

- **Consumer funding:** In the U.S., consumers finance the disposal of their unwanted medicine through the Sharps Compliance mail-back collection program at Walgreens and CVS.

Disposal and Destruction

The most effective way to eliminate unwanted drugs without doing harm to the environment or human health is to destroy the pharmaceuticals rather than disposing of them in a landfill or sewer.

Disposing of unwanted medicines through the household trash is sometimes presented as an alternative to flushing to avoid releasing pharmaceuticals into water bodies.^{xv} However, this alternative—while legal—is not encouraged because it does not permanently remove pharmaceutical compounds from the environment. In fact, active pharmaceutical ingredients have been found in landfill leachate that is then processed at wastewater treatment plants, which lack technology to filter out active pharmaceuticals.^{xvi} Therefore, sending unwanted medicines to the landfill may not prevent pharmaceuticals from entering surface or ground water.

The U.S. EPA recommends that pharmaceuticals be destroyed by high temperature incineration in a licensed hazardous waste or municipal waste combustor. The use of crematoria is not advised because such facilities are unregulated and may not provide adequate environmental protection. The EPA also disallows the burning of collected pharmaceuticals in units that are exempted from regulation used by law enforcement officials to burn contraband and illegal drugs.^{xvii}

Wisconsin facilities that might be used to destroy pharmaceuticals include high temperature incinerators, industrial boilers and municipal solid waste combustors (with or without energy recovery). New technologies, such as plasma arc gasification, may also destroy pharmaceuticals. Out-of-state facilities may include commercial hazardous waste incinerators, municipal solid waste combustors and cement kilns that burn hazardous waste. Medical waste incinerators could burn pharmaceuticals that are not considered hazardous waste.

Wisconsin's capacity to destroy pharmaceuticals could be expanded. If facility owners request it, the DNR could approve more facilities to burn collected household pharmaceuticals. Existing facilities with this potential include the Barron County municipal solid waste combustor and the Xcel Energy French Island Generating Plant in LaCrosse.

The Pulliam power plant in Green Bay may soon resume burning controlled substances. Theoretically, several other coal fired power plants could also ask DNR for permission to burn pharmaceuticals. However, current trends in the price of energy may result in the coal-fired plants switching to natural gas. It is unlikely that natural gas plants would be able to burn pharmaceuticals.

More facilities may offer to burn pharmaceuticals if the approval process were streamlined. To this effect, the DNR Air Management program intends to propose changes to its regulations over the next few years.

Education

Ongoing public education about take-back programs is vital to the programs' success. Public education and promotion campaigns should present one clear, widespread message to prevent confusion. Programs in France and British Columbia allocate 15 percent of their expense budget to promotional and educational activities.^{xviii} In fact, from 2007 to 2010, education campaigns in British Columbia raised public awareness from 31 percent to 48 percent, consumer participation from 21 percent to 36 percent, and collection by 250 percent by weight.^{xix}



Poster from *Get the Meds Out!* mail-back program

Programs in France, British Columbia, and Sweden also display signage in pharmacies, place take-back program logos on prescription labels, advertise in newspapers, on television, on billboards, and on the radio, and distribute fliers to promote their programs.

In May 2012, the Pharmacy Society of Wisconsin, in collaboration with the DNR and Pharmaceutical Waste Working Group, began distributing an informational flier for the same purpose.¹⁴

IX. OPPORTUNITIES TO IMPROVE FUTURE ESTIMATES

Estimates of program performance measures in this study are limited by the availability and accuracy of the data. The only reliable way to measure the success of household pharmaceutical waste collection programs is to ensure accurate, consistent data collection and reporting. These data can then be used to establish performance baselines against which future performance metrics for alternative programs can be assessed.

The following steps are recommended for improving the estimates of collection quantities, collection rates, and collection program costs in the future:

- Establish a process to determine the amount of prescription and over-the-counter pharmaceuticals sold in Wisconsin.
- Identify an improved conversion factor to convert prescription units to weight.
- Refine the formula used to estimate the amount of medications that are wasted.
- Establish a method to gather a representative sampling of collection program data.

¹⁴ This promotional flier can be seen in Appendix K.

- Establish a consistent, streamlined system for reporting data on weight of collected drugs and costs.

For Wisconsin, obtaining uniform collection data from municipal programs would increase data reliability, as well as the ability of the DNR to assess programs across the state¹⁵. Wisconsin should develop a data reporting protocol and investigate the use of data tracking systems, such as Re-TRAC, for program harmonization. One possible model to replicate is the web-based Pharmaceutical Collection Monitoring System (PCMS™), which is used for the Medication Cleanout™ program of the Texas Tech University Health Sciences Center School of Pharmacy and the Texas Panhandle Poison Center. The PCMS prompts collection volunteers to enter required data about the collections, thus increasing the amount and uniformity of data recorded.

Alternatively, DNR could implement a pilot reporting protocol among programs already keeping detailed data (such as Fond du Lac, La Crosse, and Waukesha Counties) to obtain representative sample data, such as the weight of medicines collected per capita annually; the percentage of medicines that are controlled substances, uncontrolled substances, and uncategorized; the number of prescriptions or OTC equivalents (weight and units) collected; and the percentage of medicines that are pills, liquids, ointments, etc.

In addition to these suggestions for improving collection program data, it is recommended that further research be conducted to identify best practices for outreach and education about these services.

X. OPPORTUNITIES FOR BUSINESS DEVELOPMENT

Unlike electronics, plastics, and other materials that can be recycled and resold to manufacturers as feedstock, unwanted household pharmaceuticals have no resale value. However, establishing the necessary infrastructure to operate expanded take-back programs will increase economic activity and provide growth opportunities for businesses involved in drug take-back, transportation and disposal.

If Wisconsin were able to boost the volume of unused pharmaceuticals collection to the per-capita levels of British Columbia (0.033 pounds per capita), Australia (0.052 pounds per capita), or France (0.44 pounds per capita), then facilities that are permitted to transport and/or dispose of pharmaceutical waste could increase revenues by anywhere from \$287,000 to \$5.7 million annually.¹⁶

Amendments to certain regulatory barriers related to the transportation and disposal of unwanted medicines could expand that opportunity to additional vendors in Wisconsin. A bill similar to California bill AB-1442, which proposed changing regulations to allow common carriers to transport household pharmaceutical waste to disposal sites, would reduce the costs of transportation by increasing competition among transporters, and would likely create new business opportunities for common carriers.

¹⁵ A template option for collecting uniform data from Wisconsin take-back programs can be found in Appendix J.

¹⁶ Based on volumes at per capita rates of cited countries and the average disposal rate for municipal programs surveyed by the UW-Extension study used for this report.

There are no available data about the job creation impacts of pharmaceutical collection programs. If new companies formed to operate pharmaceutical collection programs, such as the Post-Consumer Pharmaceutical Stewardship Association (PCPSA) in British Columbia, then new jobs in transportation and disposal would certainly be added to the Wisconsin economy. However, estimates of the number of additional jobs are uncertain and would depend on many factors, including the volume of pharmaceuticals collected, the method of collection, the regulations surrounding collection and the sorting and reporting requirements.

Additional pharmacy or retail jobs resulting from a retail-based collection program are less likely. Often, the success of retailer or pharmacy-hosted take-back programs hinges on the ease of operation and the cost-effectiveness of the program for the retailer. Nevertheless, retailers can take advantage of a number of indirect benefits associated with hosting take-back programs. Anecdotal and survey evidence suggests that pharmacy-hosted collection programs can enhance a pharmacy's image as a "green retailer"; improve customer interactions, service and relationship with the community; and increase customer loyalty, foot traffic and sales. For example, a 2010 CalRecycle Battery/Mercury Lamp Take-Back Program Focus Group Report cited an increase in foot-traffic at retail-hosted take-back locations because of customers' desire to "one-stop-shop". Comments from a survey of *Get the Meds Out!* envelope distribution locations were similarly positive, describing the intangible benefits of hosting a take-back program.

Take-back programs also provide retailers with an opportunity to use their existing loyalty programs (e.g., buy 10 get one free; grocery and convenience store rewards; cash discounts for using reusable bags; etc.) to enhance their collection program, and vice-versa. For example, retailers might give out rewards points to customers who return unused medication, encouraging participation in the take-back program while providing customers with an incentive to return to the store and make another purchase.

More research should be done to quantify the potential for economic development from increased pharmaceutical collections and regulated pharmaceutical destruction in Wisconsin.

XI. CONCLUSION

Despite Wisconsin's best efforts, current voluntary household pharmaceutical waste take-back programs are insufficient and unsustainable; they incur high operations costs, which fall primarily on the already tight budgets of local governments, while collecting only 2 percent of all available waste medication in the state. The remainder of these unwanted drugs are disposed of in landfills, flushed, or stored in medicine cabinets indefinitely, potentially contaminating water sources and creating opportunities for accidental or intentional abuse. Current regulations and a lack of consistent, sufficient funding limit the collection of controlled substances and prevent take-back program expansion. Lack of funding also hinders outreach efforts to promote take-back programs to the public. Inconvenient drop-off locations, inconsistent hours of operation and restrictions on what types of medications are permissible at a given collection further deter citizens from participating in these voluntary programs.

Conversely, industry-run programs in Canada, France, Spain, Sweden and Australia operate quite successfully with reliable funding sources as well as strong public outreach and promotional campaigns. Such programs provide potential models for Wisconsin, with pharmacies serving as

convenient waste drop-off sites and pharmaceutical manufacturers assuming financial responsibility for post-consumer collection and safe disposal of their products.

Enabling in-state destruction of collected pharmaceuticals could also reduce the costs and overall emissions of Wisconsin take-back programs. For example, the state's regulations on incinerators and other facilities could be amended to create more opportunities for the safe and environmentally sound destruction of waste pharmaceuticals. Anticipated changes to the federal Controlled Substances Act, which may alleviate some national regulatory hurdles to controlled substance transportation and storage, could serve as the impetus for state-level change.

The data utilized in this study provides a strong foundation for future decision-making. Further research could be done to more accurately determine the amounts of pharmaceuticals sold, wasted and collected in Wisconsin, as well as the costs of current and alternative take-back programs. The potential effects of changing regulations on industry and on the cost of pharmaceutical transportation and disposal should also be more precisely determined. Further research is also needed to refine messaging and strengthen public outreach efforts.

Change is needed to bring Wisconsin's unwanted pharmaceutical collection programs up to the standards set by other industrialized nations. A low cost, comprehensive and convenient collection program with a sustainable funding source is called for to benefit the health and safety of Wisconsin's residents and the environment.

XII. APPENDICES

Appendix A: Definitions, Terms and Abbreviations

1. **Actual Expenditures** – All monetary expenditures of take-back programs, excluding the value of volunteer labor.
2. **Amount Available for Collection** – The total quantity of unwanted pharmaceuticals stored in all households. May be presented in prescription equivalent units or pounds.
3. **Collection Event** – A single occurrence of a one-day collection.
4. **Collection Program** – Also referred to as a Take-Back Program. Examples include: Clean Sweeps, funded by DATCP, and National Take Back Events, funded by the DEA.
5. **Controlled Substances** – Pharmaceuticals and/or illegal recreational drugs that are subject to regulations under the Controlled Substances Act and require a law enforcement officer to be present upon collection. A list of controlled substances can be found at <http://www.dea diversion.usdoj.gov/schedules/>.
6. **Cyclamed** – The name of the pharmaceuticals company and the nonprofit, industry-governed, industry-funded take-back program it operates in France.
7. **Defined Daily Dose** – The daily amount of prescription or OTC medicine that is prescribed or recommended for use during the course of the prescription or usage period.
8. **Drug Enforcement Administration (DEA)** – A government administrative office established in 1973 that is responsible for enforcing the controlled substances laws and regulations of the U.S. and prosecuting offenders. The DEA hosts and funds National Take-Back Events.
9. **Get the Meds Out!** – A pilot mail-back collection program operated for four months in 2011 by the University of Wisconsin Solid & Hazardous Waste Education Center (UW SHWEC) and funded by a grant from the U.S. EPA Great Lakes Regional Initiative (GLRI).
10. **Household** - Household pharmaceuticals are prescription drugs and over-the-counter drugs from residences, including pet medications and medications from certain residential care facilities. See <http://dnr.wi.gov/files/PDF/pubs/wa/wa1214.pdf> for more on the distinction of a residential care facility as a household.
11. **Mail-Back Collection** – A consumer-oriented take-back program through which users, at their convenience, send their unwanted medicines in an envelope to a predetermined collection site.
12. **Manufacturer** – A company that makes and markets pharmaceuticals. Also referred to as a Producer. Manufacturers include: Abbott Laboratories; Bayer Healthcare Pharmaceuticals; Galderma Laboratories; GlaxoSmithKline; Novartis Corporation; Perrigo Company; Pfizer, Inc.; Proctor & Gamble; Purdue Pharma LP; Teva Pharmaceuticals; and Vertex Pharmaceuticals.
13. **Medical Sharps** – medical equipment or clinical laboratory articles that may cause punctures or cuts. Sharps include, but are not limited to, contaminated, unused and disinfected items such as hypodermic needles, syringes with needles attached and lancets.
14. **Medical Waste Materials** – For the purposes of this report, medicines and medical instruments (e.g., medical sharps) used to administer medications.
15. **Medication** – Prescription and over-the-counter pharmaceuticals, quantified in this report as units of sale (packages) and as pounds. Also referred to as Medicine and Pharmaceuticals.

16. **Medicine** – Prescription and over-the-counter pharmaceuticals, quantified in this report as units of sale (packages) and as pounds. Also referred to as Medication and Pharmaceuticals.
17. **Medicine Weight** – For the purposes of this report, the estimated weights of pharmaceuticals sold and unwanted pharmaceuticals. The estimated average prescription and over-the-counter medicine weight does not include packaging. The weight of medicines collected through Wisconsin municipal programs includes some packaging. The weight of medicines collected through the *Get the Meds Out!* program does not include packaging.
18. **Municipal Collection or Take-Back Program** – Any take-back program predominantly run and funded by local or state government. Not included in this definition are take-back programs and collections that are run and/or funded exclusively by hospitals, pharmacies, clinics or other such private institutions.
19. **National Community Pharmacists Association (NCPA)** – An industry association that represents America’s community pharmacists, including owners of more than 23,000 pharmacies.
20. **Non-Controlled Substances** – Pharmaceuticals that do not contain any amount of a controlled substance. See Controlled Substances.
21. **One-Day Collection** – A take-back program that operates for one day, for a set number of hours. A one-day collection may happen once or twice per year.
22. **One-Day Collection Location** – The location at which a one-day collection event takes place.
23. **Over-the-Counter Medicine** – The medicine contained in one package of medicine sold at a retail store without the need for a doctor’s prescription. Also referred to as OTC medicine.
24. **Permanent Collection** – A take-back program which ensures public access on a consistent basis. A permanent location may or may not have a drop-box and may or may not be open 24 hours a day, seven days a week.
25. **Permanent Collection Location** – The location at which a permanent collection operates. A Permanent Collection program may have multiple locations.
26. **Pharmaceuticals** – Prescription and over-the-counter pharmaceuticals, quantified in this report as units of sale (packages) and pounds. Also referred to as Medication and Medicine.
27. **Pharmaceutical destruction** – Any method of disposal of unwanted medication in which pharmaceutical compounds are destroyed, for example, by high-temperature incineration.
28. **Pharmaceuticals Disposal** – The removal of medication from a household, including flushing or landfilling.
29. **Post-Consumer Pharmaceuticals Stewardship Association (PSPCA)** – A nonprofit association governed by a board of pharmaceutical industry representatives responsible for operating an unwanted pharmaceutical take back program in British Columbia and other Canadian provinces. The collection program is industry funded.
30. **Prescription Equivalent Unit** – The amount of medicine in an over-the-counter medicine sale unit that is roughly equivalent to the quantity of medicine in a single refill of a prescription.
31. **Prescription Medicine** – The amount of medication prescribed to a patient by a licensed physician before any refills or subsequent individual refills.

32. **Producer** – A company that manufactures and markets pharmaceuticals. Also referred to as a Manufacturer.
33. **Reverse Distributor** – A company that processes expired or excess product from the original wholesaler/distributor or from the client of the wholesaler/distributor. These products have not been sold to the consumer.
34. **Total Program Costs** – All monetary expenditures plus value of volunteer labor.
35. **Take-Back Program** – A program through which unwanted pharmaceuticals are collected for proper disposal. Also referred to as a Collection Program.
36. **Unwanted Pharmaceuticals** – Pharmaceuticals (including prescription and over-the-counter medicines) that are expired or unused by households. Also referred to as unwanted medicines or unwanted medications.
37. **Uncategorized Pharmaceuticals** – Medicines that have not been sorted to determine whether they are controlled or non-controlled substances.
38. **UW-Extension study** – Conducted over the winter of 2011-2012, this study sought to determine the amount of pharmaceuticals collected by existing Wisconsin take-back programs and the costs associated with running municipal programs.
39. **Wastage** – The quantity of unwanted medicines as a percentage of medicines sold.
40. **Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP)** – Wisconsin government department that operates the *Clean Sweep* collection program for unwanted pharmaceuticals.

Appendix B: 2011-12 UW-Extension Study Questionnaire

Questionnaire for Drug Disposal Locations in Wisconsin

Please Enter

Name of Facility:

Address:

County:

Contact Person:

Phone:

Email:

Website:

Is this a One Day or Permanent Collection?

For Permanent Collection, Start Date and Hours:

For One Day Collection, Date and Hours:

How many pounds were collected?

Controlled Substances _____ Non Controlled Substances _____

If these are not separated, please enter total pounds _____

Do these numbers include packaging? Yes ___ No ___

How does the facility dispose of the meds?

Disposal Cost (may include transportation costs):

Additional Cost Information

Funded By:

Publicity Cost:

Staffing Cost:

Value of Donated Time:

Value of Donated Materials:

TOTAL:

Does your facility participate in a specific drug collection program (For example, P2D2)?

Yes ___ No ___

If part of a program, please describe: _____

1. What triggered your facility's participation in a drug collection program?

Additional Comments?

THANK YOU FOR YOUR PARTICIPATION!

Appendix C: List of Surveyed Locations in UW-Extension Study

Surveyed Wisconsin Departments and Organizations supporting Collection Programs

Ashland Police Department
Ashland County UW-Extension
Barron County Sheriff's Department
Barron County Safe and Stable Families Coalition
Bayfield County Sheriff's Department
Bayfield County UW-Extension
Brown County Hazardous Waste Department
Buffalo County UW-Extension
Burnett County Sheriff's Department
Calumet County UW-Extension
Chippewa County Recycling Division
Clark County Sheriff's Department
Columbia County Solid Waste Department
Columbia County Sheriff's Department
Portage Police Department (Columbia County)
Prairie du Chien Police Department (Crawford County)
Dane County Public Health Department
Fitchburg Police Department (Dane County)
Middleton Community Development (Dane County)
Sun Prairie Police Department (Dane County)
Beaver Dam Police Department (Dodge County)
Horicon Police Department (Dodge County)
Juneau Police Department (Dodge County)
Door County Sheriff's Department
Douglas County Solid Waste Department
Superior Public Works Department (Douglas County)
Dunn County Sheriff's Department
Eau Claire County Recycling Program
Drug Free Communities of Fond du Lac County
Crandon Police Department (Forest County)
Grant County Health Department
Green County Health Department
Green Lake County Land Conservation Department
Iron County Health Department
Jackson County Sheriff's Department
Jackson County Recycling Department
Jefferson County Planning and Zoning Department

Mauston Police Department (Juneau County)
Kenosha County Health Department
Kewaunee County Sheriff's Department
Kewaunee County UW-Extension
La Crosse County Solid Waste Department
Darlington Police Department (Lafayette County)
Langlade County Health Department
Lincoln County Health Department
Merrill Police Department (Lincoln County)
Manitowoc County Recycling Center
Marathon County Solid Waste Department
Marinette County Sheriff's Department
Marinette County Health and Human Services Department
Montello Police Department (Marquette County)
Milwaukee Metropolitan Sewerage District
Bayside Police Department (Milwaukee County)
Brown Deer Police Department (Milwaukee County)
Cudahy Police Department (Milwaukee County)
Fox Point Police Department (Milwaukee County)
Greendale Police Department (Milwaukee County)
Greenfield Police Department (Milwaukee County)
Oak Creek Police Department (Milwaukee County)
Shorewood Police Department (Milwaukee County)
South Milwaukee Police Department (Milwaukee County)
St Francis Police Department (Milwaukee County)
West Allis Police Department (Milwaukee County)
Monroe County Drug Free Communities Program
Tomah Police Department (Monroe County)
Oconto Falls Police Department (Oconto County)
Oconto County Public Health Department
Oneida County Solid Waste Department
Outagamie County Solid Waste Department
Starting Point of Ozaukee County
Pepin County Solid Waste Department
Pierce County Sheriff's Department
Pierce County Solid Waste Department
Polk County Sheriff's Department
Portage County Solid Waste Department
Price County Land Conservation Department
Price County Sheriff's Department
Park Falls Police Department (Price County)
Racine County Health Department
Racine Police Department (Racine County)

Sturtevant Police Department (Racine County)
Waterford Police Department (Racine County)
Richland Center Police Department (Richland County)
Rock County Health Department
Rusk County Sheriff's Department
Ladysmith Police Department (Rusk County)
St Croix County Sheriff's Department
Reedsburg Police Department (Sauk County)
Sauk County Land Conservation Department
Sawyer County UW-Extension
Shawano Police Department (Shawano County)
Sheboygan County Planning & Conservation Department
Taylor County Zoning Department
Trempealeau County Health Department
Vilas County UW-Extension
Walworth County Solid Waste Division
Washburn County Sheriff's Department
Washburn County Health Department
Washington County Land and Water Conservation Division
Waukesha County Drug Free Communities Program
Waupaca County Sheriff's Department
Winnebago County Drug Enforcement

Additional Data Obtained From:

Veolia Environmental Services, Inc.
Wisconsin Department of Agriculture Trade and Consumer Protection
Wisconsin Drug Enforcement Administration

Appendix D: Collection Trends in Wisconsin

Methodology

Number of Locations

Determining the exact number of collection locations statewide posed some difficulty. The DEA supplied a number of sites for each of their Take Back Events, but an archived list was not available. Clean Sweep lists were available for 2010, 2011 and 2012. Additional collections are added to the UW-Extension SHWEC database; however, this is a voluntary list. All of the Clean Sweep collections are accounted for in the SHWEC database, but not all of the DEA locations are accounted for.

From the DEA Take Back Events:

DEA Take Back Events	Number of Sites		Number of Counties	Number of Sites that are Permanent Locations
	From DEA	Accounted for by SHWEC List	Accounted for by SHWEC List	Accounted for by SHWEC List
Fall 2010 (9/25)	86	32	17	13
Spring 2011 (4/30)	136	116	44	21
Fall 2011 (10/29)	127	0	0	0
Spring 2012 (4/28)	179	135	47	40
Fall 2012 (9/29)**	147	147	57	46

* The number of Sites, Counties and Permanent Locations was determined by cross checking the SHWEC database with the DEA Take Back Event dates. Notably, there were no collections listed for the DEA Take Back III collection event, which occurred on October 29, 2011. ** Data recorded as of September 28, 2012.

From the DATCP Clean Sweep Program:

	Number of Locations	Number of Counties	Number of these that are Permanent Locations
2010	75	33	10
2011	35	17	11
2012	122	35	63

From the UW-Extension SHWEC Database:

Permanent Collection Locations

	Number of Locations	Total Number of Counties	New Counties this Year	New Locations this Year
Pre-2010	5	5		
2010	62	27	22	57
2011	139	48	21	77
2012	162	52	4	23

One-Day Collection Locations

	Number of Locations	Number of Counties
2010	88	39
2011	136	49
2012	182	59

Collected Drug Weight

The UW-Extension study determined the amount of drugs that were collected in Wisconsin by interviewing known collection locations throughout the state and supplementing this information with data from: Veolia Environmental Services, the state-contracted waste hauler; the Wisconsin DEA, which operates Wisconsin’s Take Back Events; and the Maine DEA, which collected and disposed of unwanted pharmaceuticals for Wisconsin’s *Get the Meds Out!* program.

From the UW-Extension study, all data are in units of pounds:

	2010		2011	
	Permanent	One-Day	Permanent	One-Day
Non-controlled	8,064	40,821	17,281	30,491
Controlled	463	3,220	3,891	3,379
Uncategorized	731	1,125	8,478	2,344
Total	9,258	45,166	29,650	36,213
	54,424		65,863	

The totals in the table above represent the summation of all weights obtained from telephone and email interviews, supplemented with Veolia’s weight data for individual collections and communities that were unable to participate in the survey. In addition to these numbers, the DEA supplied collected weights for each of its four Take Back Events from Fall 2010 to Spring 2012. The DEA was not able to supply more detailed information; as a result, its numbers are aggregates for the whole state.

From the Wisconsin DEA, all data are in units of pounds:

Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012
4,480	18,901	19,820	37,642	22,562

Many of the communities interviewed in the UW-Extension study used the DEA program to dispose of their drugs. In an effort to avoid recording the collected medication weight twice, the survey data were cross-checked. Then, the given weight from any counties, communities, or programs that indicated DEA-managed disposal was subtracted from the DEA aggregated number. This was done for the 2010 and 2011 DEA totals.

All data are in units of pounds:

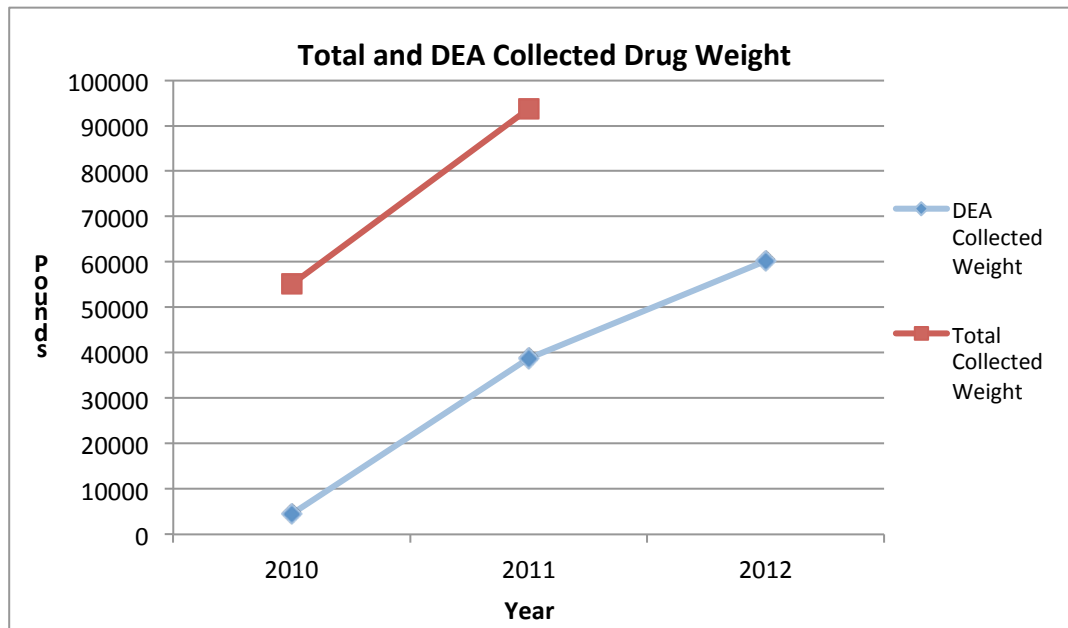
POUNDS COLLECTED	2010	2011
DEA Total	4,480	38,721
Total accounted for by the UW-Extension study	3,839	13,681
DEA 'Additional' Total	641	25,040

For 2010 the total drug weight collected by Wisconsin take-back programs is estimated to be 55,065 pounds:

$$54,424 + 641 = 55,065 \text{ pounds}$$

For 2011, the collected weight from the short-lived *Get the Meds Out!* mail-back program must be added to the total. As of June 2012, the Maine DEA had received 2,890 pounds of drugs from Wisconsin. The weight of the drugs collected via the mail-back program is accounted for in the 2011 total, both for the sake of simplicity and because the program officially ran from August to December of 2011. The 2011 total, then, is 93,793 pounds of collected unwanted medication:

$$65,863 + 25,040 + 2,890 = 93,793 \text{ pounds}$$



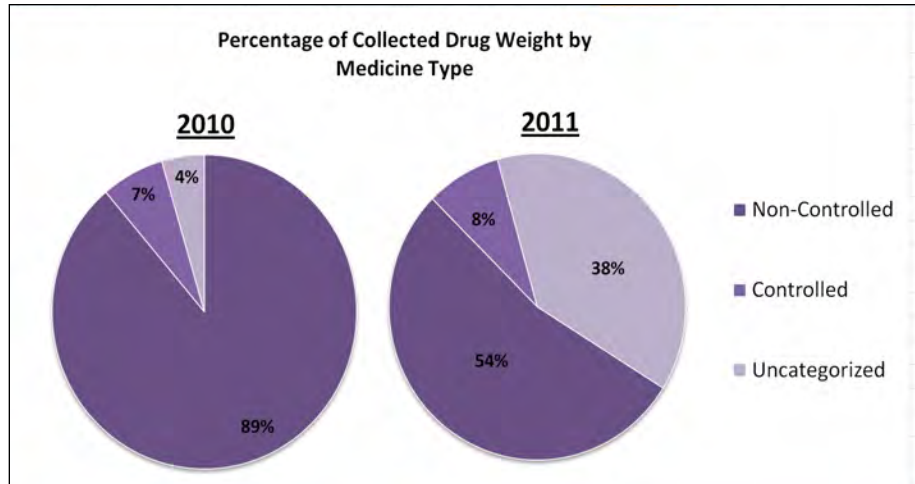
Overall, the amount of collected unwanted pharmaceuticals increased 70 percent between 2010 and 2011. It is likely that this amount will continue to increase in 2012 and beyond as the number of collection programs and locations increases.

Trends

Two clear trends in the collected weight data emerge when the data are further analyzed by medication type and by program type:

Increase in Uncategorized Drugs

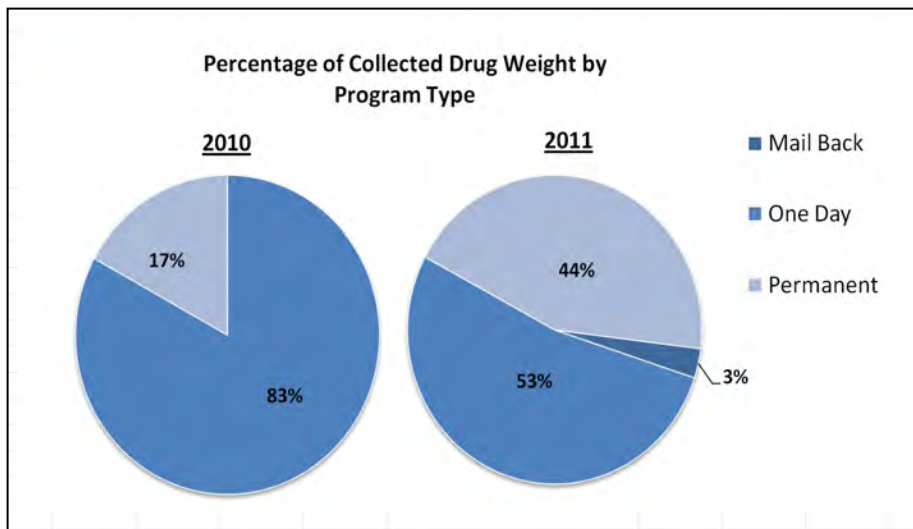
When the amount of unwanted medications collected in Wisconsin in 2010 and 2011 is analyzed by substance category, it becomes clear that there was an increase in the amount of drugs that went uncategorized. One-day collections roughly doubled their amount of collected uncategorized drugs, slightly increased the amount of collected controlled substances, and experienced a decrease in the amount of collected non-controlled substances. Permanent locations collected more of all three substance types in 2011 than they did in 2010, increasing the amount of non-controlled substances by a factor of roughly 2.1; the amount of controlled substances by a factor of 8.4; and the amount of uncategorized medicines by a factor of nearly 11.6. None of the pharmaceuticals collected through the mail-back program went uncategorized; between 13 and 15 percent of those drugs were classified as controlled substances and the rest were non-controlled.



The dramatic increase in uncategorized drugs can be attributed chiefly to the increase in the weight of additional unwanted medications collected by the DEA, which were not sorted into substance categories. This number increased by 3,806 percent from 2010 to 2011. It is likely that the greater availability of no-cost DEA disposal opportunities in 2011 also contributed to the increased number of uncategorized drug collections among permanent and one-day take-back programs.

Increase in Permanent Collections

The DEA Take Back Events are one-day collections; however, many permanent collections in Wisconsin save their collected drugs to dispose of them with the DEA because this method does



not cost anything for the permanent collection site operators. Thus, the DEA’s uncategorized drugs can fall into both controlled and non-controlled substance types, and come from an unknown collection program. For the purposes of this report’s analysis, the DEA drugs were distributed proportionally to one-day and permanent collection sites in 2011.

Limitations to the data

Additional known collections are added regularly to the UW-Extension SHWEC database; however, submissions to the database are voluntary, so some existing collection programs may be inadvertently omitted. All of the Clean Sweep collections are accounted for in the SHWEC database, but not all of the DEA locations are.

An attempt was made not to count a given location that held more than one collection in a given year. For example, the Washington County Highway Facility held collections in April, June, and October of 2010, but is counted only once as a location in 2010. Locations that had both permanent collections and one-day events were not counted in the one-day location total, but are counted in the permanent location total. For example, the Fond du Lac Police Department offers a permanent collection site and hosts DEA events, but the location is counted only as a permanent collection site.

Because the survey used in this study was conducted primarily by phone and email, occasionally, known programs could not be contacted directly, so the DEA, DATCP, and Veolia Environmental Services, Inc. provided supplementary data. Many programs are charged by the pound for the disposal of their drugs and generally keep better data on the amount collected. The state contracted waste hauler, Veolia, was able to provide data for programs doing disposal with them. For programs with a no-cost disposal option, such as those participating in the DEA Take Back Events, record-keeping was not required and, in fact, is sometimes considered a hassle by the program operator(s).

There is little uniformity to record-keeping throughout the state because collection programs are organized and operated at the local level. While some program operators keep meticulous records, others could only provide estimates. For example, several programs gave the number of boxes, plastic bags, or Rubbermaid tubs of collected pharmaceuticals. Other estimates were given in gallons and, in the case of the Park Falls Police Department in Price County, records were kept of the number and type of pills, bottles, and patches collected—but not their weight. Moreover, some programs recorded the weight of medicines that were still in their packaging; other programs weighed medicines without packaging. These factors make it difficult to present accurate numbers for the estimated amount of pharmaceuticals that were collected by take-back programs.

Additionally, this study did not obtain weight data from pharmaceutical collection programs operated exclusively by local hospitals, pharmacies, or other private entities and so such collections are not represented. It is also possible that some existing take-back programs were unintentionally overlooked in this study.

Additional inconsistencies in the data presented here could arise from outlying events. For example, the Reedsburg Police Department in Sauk County provided a full third of the DEA's total Wisconsin collection in the third Take Back Event, which amounted to roughly 6,600 pounds. The unusually large amount of drugs collected in this county of just under 62,000 inhabitants was due to a retired pharmaceutical representative who had passed away in their community, leaving behind a large quantity of drugs that were in his possession at the time of his death. This event inflated the collected pharmaceutical numbers and is not representative of the community. Because of these variations and gaps in Wisconsin pharmaceutical collection data, the numbers presented here should be viewed as rough estimates.

Appendix E: Pharmaceutical Sales in Wisconsin

In order to give context to the quantity of unwanted medicines collected in Wisconsin and to establish a baseline rate of collection, it was necessary to determine how many unwanted pharmaceuticals were available for collection in the State. In order to determine the quantity available for collection, we first determined the quantity of pharmaceuticals sold in Wisconsin.

The quantity of pharmaceuticals available for collection was then determined through the following formula:

$$\left(\begin{array}{l} \text{Units of} \\ \text{Prescriptions} \\ \text{Sold} \end{array} + \begin{array}{l} \text{Units of OTC} \\ \text{Medicines Sold} \end{array} \right) \times \begin{array}{l} \text{Rate of Medicine that} \\ \text{is Unused/Wasted} \end{array} = \begin{array}{l} \text{The Units of Medicines} \\ \text{Available for Collection} \end{array}$$

Where the given data are:

GIVEN DATA	VALUE
Units of Prescriptions Sold	67.4 million
Units of OTC Medicines Sold	51.4 million
Rate at which Medicine goes Unused	33%

U.S. Prescription Pharmaceutical Sales

United States pharmaceutical distributors deliver almost 4 million prescription medicines annually to approximately 200,000 pharmacies, hospitals, long-term care facilities, and various other point-of-sale locations nationwide. Of these, 92 percent^{xx} are distributed to household users through traditional pharmacy chains (43.3 percent), independent pharmacies (18.7 percent), food stores (12.3 percent), mass merchants (10.6 percent), and mail order pharmacies (6.6 percent).^{xxi}

Sales of prescription and over the counter medicines in the U.S. have been growing steadily since 2005. Between 2005 and 2010, prescription drug sales grew an average of 2.3 percent per year.^{xxii} Research by McKinsey suggests that the U.S. spends \$98 billion more on medicines that would be expected based on per capita income compared with other wealthy nations.^{xxiii} The U.S. spent \$307 billion on prescription drugs in 2010, the equivalent of \$898 per capita.^{xxiv}

U.S. Over-the-Counter Medicine Sales

Over-the-counter (OTC) medicines make up a significant portion of medications purchased in the United States. In 2010, OTC spending totaled around \$28.5 billion^{xxv}. Excluding personal care products, which are included in the OTC category, total OTC medicine spending in the U.S. is estimated at \$22 billion¹⁷. Based on average cost estimates for over-the-counter medicines^{xxvi}, this spending represents approximately 2.8 billion OTC products sold. Combined, an estimated 6.8 billion prescriptions and OTC medicines are sold in the U.S. annually.

¹⁷ For additional detail on the method for estimating OTC medicine spending as a percentage of total OTC spending, and for calculating the number of units of OTC medicine sold, see the accompanying Excel spreadsheet.

Wisconsin Specific Prescriptions and Over-the-Counter Medications

According to the Kaiser Family Foundation 62.9 million retail prescription drugs were sold through retail pharmacies in Wisconsin in 2010.^{xxvii} However, this figure does not include mail-order prescription fulfilled for Wisconsin residents. Based on IMS Health data, mail order prescriptions account for 6.6 percent of the total prescriptions dispensed in 2010 nationally.^{xxviii} Extrapolating using these data, an estimated 67.4 million prescriptions were dispensed in Wisconsin in 2010 through all residential channels, including mail order. By 2012, Wisconsin prescription sales volume could be as high as 72 million if sales continue to grow at 2.3 percent.

In order to estimate the quantity of OTC medicines sold in Wisconsin, we scaled national sales data for OTC medicines (2.8 billion units) to the Wisconsin population. Using this method, 51.4 million OTC units, or approximately 9 OTC medicines per capita, were sold in Wisconsin in 2010. Combined, an estimated 118.8 million prescription and OTC medications are sold annually in the state of Wisconsin.

Methodology

Prescription Units

The following formula was used to determine the total prescriptions dispensed in Wisconsin:

$$62.9 \text{ million prescriptions} \div (1-.066) \text{ percent} = 67.4 \text{ million prescriptions}$$

OTC Units

Sales data for over-the-counter medicines were available only in dollars and had to be converted to prescription equivalent units. The following assumptions were used to calculate the number of OTC units sold:

ASSUMPTION	VALUE
National Sales of OTC Medicines	\$21.7 billion
Average OTC Cost Generic	\$7.90
U.S. Population	308,745,538
National OTC Unit Sales Per Capita	8.90
Wisconsin Population	5686986
Wisconsin Unit Sales of OTC Medicines	50,600,000

To estimate the number of units of OTC medicines sold nationwide, an average OTC medicine price was calculated first. Data from a sampling of generic and name brand medicines sold in Massachusetts were used to calculate the average OTC medicine sale price.^{xxix} The national OTC sales figure (\$21.7 billion) was divided by the average medicine price (\$7.90) to obtain the units sold nationally.

The national unit data was divided by the U.S. population as of the 2010 census. The resulting per capita OTC unit sales were 8.9 units per capita. This was scaled to the Wisconsin population as of the 2010 Census to reach the 50.6 million unit estimate for the quantity of OTC medicines sold in the state. Additional data and calculations used to derive sales of OTC medicines can be found in the accompanying Excel spreadsheet.

Data Limitations

Average Over-the-Counter Medicine Sale Price

The average sale price for OTC medicines was based on Massachusetts data only. Because the northeast region has a higher cost of living, the average sale price may be skewed high. If so, the national OTC unit sales estimate would be skewed low. This would also affect the estimated Wisconsin OTC unit sales estimate, which was scaled from national estimates to the Wisconsin population.

Total sales of Over-the-Counter Medicines

Limited data were available on the quantity of over-the-counter medicines sold. Total sales volumes for the OTC category include personal care products which were excluded from this study. The total OTC medicine sales were estimated based on the category breakdown provided by the Consumer Healthcare Products Association.^{xxx}

Appendix F: Estimated Percentage of Medications That Go Unused

Pharmaceutical waste from households in the U.S. can be estimated at around one-third of the defined daily doses (DDD). The amount of household pharmaceutical waste has not been accurately determined, but can be approximated based on studies in the U.S. and abroad. Surveys of medicine stored in households in Chapel Hill, NC; Great Britain; Sweden; Iran; France; Saudi Arabia; and four other Arabian Gulf countries found similar rates of pharmaceutical waste.^{xxxii} Figure 1 shows the percentage of household medicines that are wasted for each region, with a mean of 33 percent.

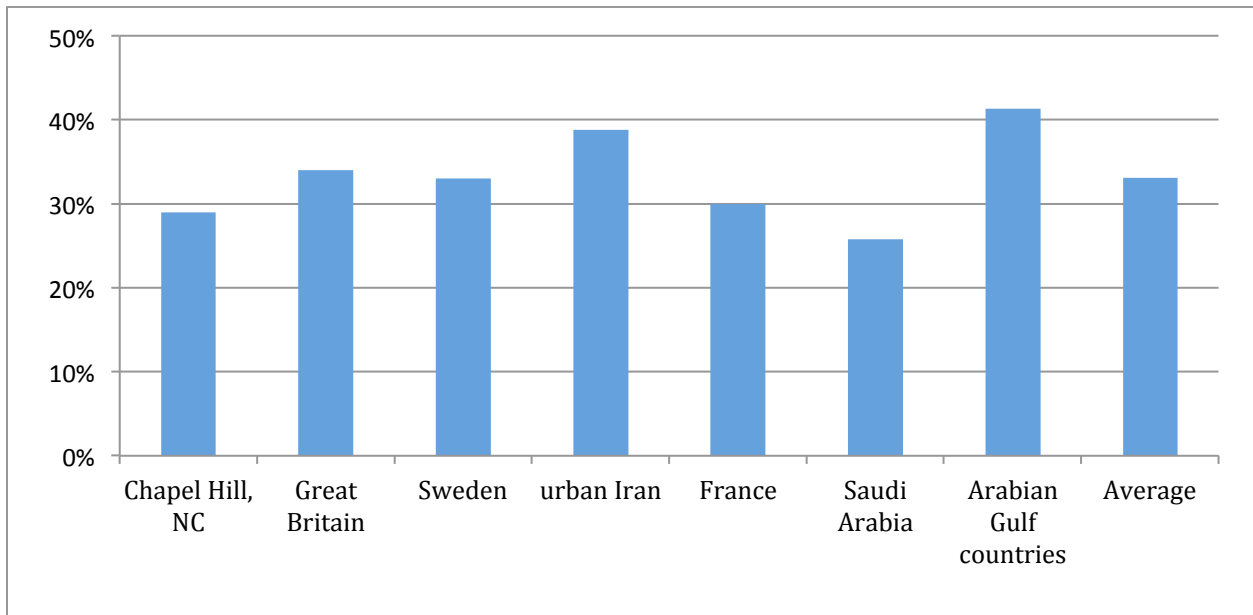


Figure 1: Pharmaceutical waste as a percentage of medicines stored in households. Chapel Hill’s study measured the percentage of medications that are expired and does not include unexpired medications that will not be used. Great Britain’s calculation considers prescription medications, but not OTCs. Sweden’s results are based on nurses’ observations during home visits, and may not be representative of broader Swedish society. Arabian Gulf countries included in the study are Qatar, United Arab Emirates, Kuwait, and Oman.^{xxxii}

Organizations in the U.S. present similar estimates, as presented in Figure 2, below. Studies with different methodologies estimate lower percentages of household pharmaceutical waste. For example, a 2008 study conducted by the Department of Environmental Engineering Sciences at the University of Florida analyzed samples of solid waste and calculated that, at minimum, 11 percent of medications are not used.^{xxxiii} Because some unused medications are discarded via the sewer system and not landfilled with household trash, this approximation is likely an underestimation. The pharmaceuticals industry estimates that households waste just 2-3 percent of medications.^{xxxiv} However, this estimate is unreasonably low given the data on rates of prescription discontinuation, and is not consistent with the results of any other national or international studies.

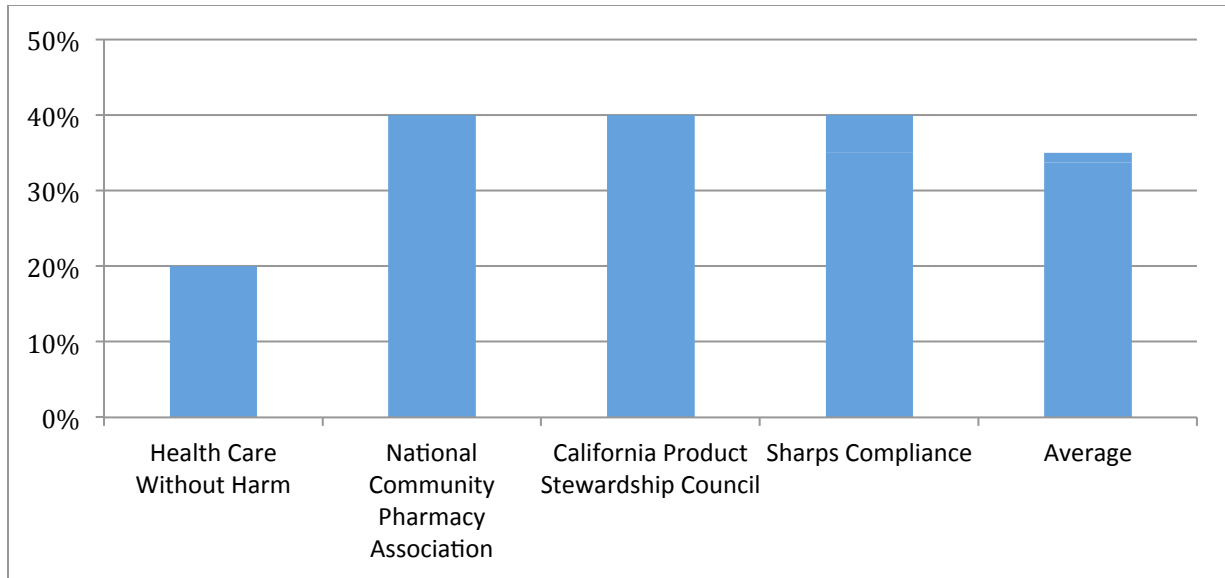


Figure 2: Estimates from various U.S. organizations of the percentage of medicines that go unused. Sharps Compliance’s estimate ranges from 35 percent to 40 percent, and the average ranges from 34 percent to 35 percent.^{xxxv}

Similarities in the amount of pharmaceutical household waste across geographic regions could be the result of universal medication-taking behaviors, such as the tendency to stop taking medications before the prescribed treatment time has lapsed. The pharmaceutical industry predicts that only half of patients will continue to take their medication as prescribed after one year of starting a treatment.^{xxxvi} Studies in Europe and the Middle East confirm this approximation, as shown in Figure 3. The New England Healthcare Institute estimates that only one-half to two-thirds of Americans complete the full prescription of medication.

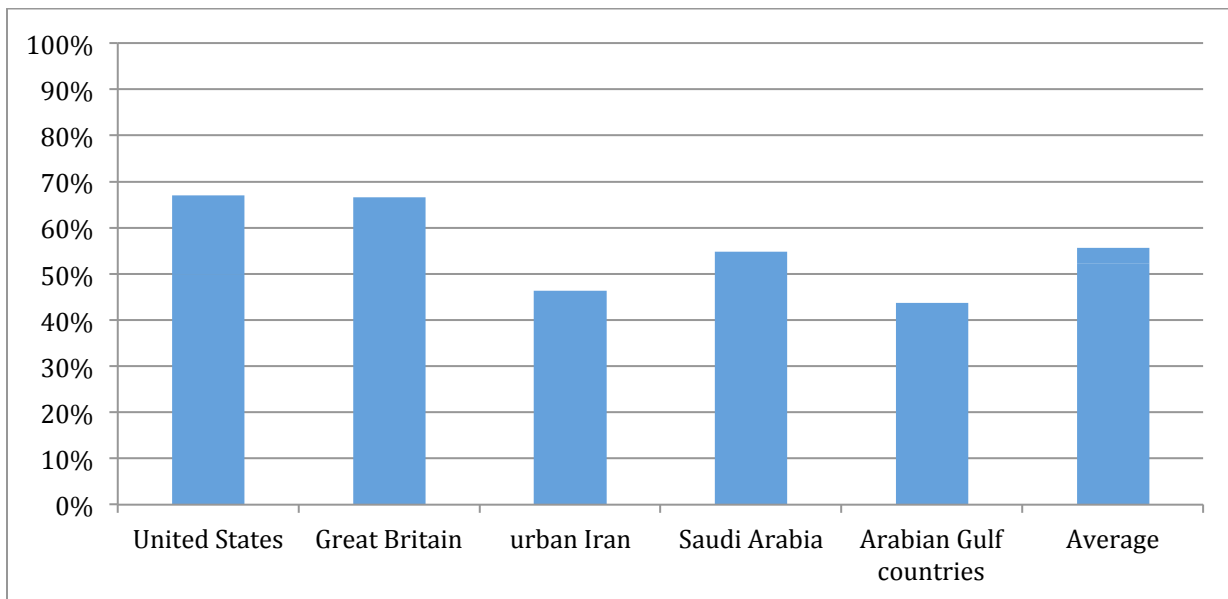


Figure 3: Rates of patient adherence to medical prescriptions. The estimate for the U.S. ranges from one-half to two-thirds, resulting in an average that ranges from 52 to 55 percent. The studied Arabian Gulf countries are Qatar, United Arab Emirates, Kuwait, and Oman.^{xxxvii}

Approximately 33 percent of medicines sold in Wisconsin go unused, equal to about 39.6 million prescriptions and over-the-counter equivalents. This estimate is supported by data from in-home surveys conducted in the U.S. and various foreign countries; by estimates from U.S. organizations; and by U.S. rates of patient adherence to prescriptions.

Surveys of the U.S. population that are conducted by non-U.S. groups might not provide an accurate estimate of the amount of unused pharmaceuticals in the U.S. because of differences in culture and health care systems. Moreover, there is no statistical model for including all potential variables that affect how many pharmaceuticals are available for collection, such as the average length of time a person stores medication in the home before disposing of it.

The U.S. Centers for Medicaid and Medicare (CMM) are conducting a survey in 2013 that will offer a more detailed assessment of the quantity of medicines that go unused in the U.S. Once these data become available, the Wisconsin will be able to extrapolate from the CMM data an improved estimate of the amount of medicine available for collection. If a valid model for calculating this figure becomes available, it should be used. However, in the absence of additional data, the current estimate of 33 percent of medicine sold is supported by numerous studies and can be used confidently as a reasonable approximation of the amount of medicine available for collection.

Appendix G: Conversion Methodology Used to Calculate the Collection Rate

Because medicine sales are recorded in dollars or units, and collected unused medicines are recorded in pounds, it was necessary to develop a methodology for converting units to pounds so that a collection rate could be calculated.

Developing the Collection Rate by Converting Metrics

The baseline pharmaceutical collection rate was determined through the following calculation:

Figure 1: Collection Rate Calculation

$$\frac{93,500 \text{ lbs unwanted pharmaceuticals collected}}{4.4 \text{ million lbs unwanted pharmaceuticals available for collection}} = 2\% \text{ Collection Rate}$$

This calculation was created based on the following assumptions:

ASSUMPTIONS	FIGURE
Average Weight of Prescription Equivalent Medicine	0.11
Total Prescriptions Dispensed in WI	67,400,000
Total Over-the-Counter Units Sold in WI	51,400,000
Total Prescription Equivalent Units of Medicine Sold in WI	118,800,000
Percentage of Medicine Unwanted and Available for Collection	33%
Total Unwanted Medicine Available for Collection in Units	39,600,000
Quantity of Unwanted Medicine Collected in WI	93,500

Calculating the Denominator of the Collection Rate Equation

To calculate the denominator of the collection rate equation (the weight, in pounds, of unwanted pharmaceuticals available for collection), a series of calculations was made:

1. Units of Unwanted Medicine Available for Collection
2. Average Weight of a Prescription Equivalent Unit
 - a. Average Weight of a Unit of Returned Medicine
 - b. Average Weight of a Unit of Sold Medicine

Calculating Units of Unwanted Medicines Available for Collection

The units of unwanted medicines available are estimated to be 33 percent of medicines sold. The units of unwanted medicines available for collection are calculated as follows:

$$118.8 \text{ million units sold} \times 0.33 = 39.6 \text{ million units available for collection}$$

Calculating Average Prescription Weight

The average weight of a prescription equivalent medicine was determined using data gathered by the UW-Extension *Get the Meds Out!* mail-back program. The average weight of a prescription (Rx) or over-the-counter (OTC) equivalent (the denominator in the above equation) was calculated as follows:

$$\frac{\text{lbs of medicines per envelope}}{\text{units of medicine per envelope}} = \text{average weight of returned medicines in lbs}$$

$$\frac{\text{average weight of returned medicines in lbs}}{\text{lbs}} \times \frac{\text{percent of unused medicine in returned Package of medicine}}{\text{Package of medicine}} = \text{average weight of a full medicine in lbs}$$

To obtain the pounds of medicines returned per envelope (0.4 pounds), the total weight of medicine that was collected through the *Get the Meds Out!* program and then discarded between October 2011 and April 2012 (2,259.7 pounds) was divided by the number of envelopes returned (5,326 envelopes).

$$\frac{2,259.7 \text{ pounds of medicines returned}}{5,326 \text{ envelopes returned}} = 0.4 \text{ lbs medicines/envelope}$$

The average weight of medicine per envelope (0.4 pounds) was then divided by the average number of Rx and OTC equivalents returned per envelope (5.9 units). This calculation provided the average weight per medicine collected (0.07 pounds).

$$\frac{0.4 \text{ lbs medicines per envelope}}{5.9 \text{ units of medicine per envelope}} = 0.07 \text{ lbs average weight of returned medicines}$$

On average, medicines returned through take-back programs are 65 percent full.^{xxxviii} Given this assumption, a full prescription would weigh 1.77 ounces (0.111 pounds). To calculate the average weight of a full prescription, the average weight of a partially-used medicine was divided by 65 percent.

$$\frac{0.07 \text{ lbs average partially used medicine weight}}{\text{weight}} \times \frac{65\% \text{ medicines remaining in a package of returned medicine}}{\text{of returned medicine}} = 0.111 \text{ lbs average of a full medicine}$$

Another Look at Average Medicine Weight

To confirm the estimate for the average weight of a prescription equivalent medicine, an alternate method for establishing average medication weight was used. The National Community Pharmacists Association (NCPA) estimates that 40 percent of medicines go unused annually, weighing in at a total of 200 million pounds.^{xxxix} By applying these figures to IMS Health data for the number of prescriptions filled nationally in 2010 (4 billion), the calculated average prescription weight is 2 ounces (0.125 pounds).

$$\frac{200 \text{ million lbs}}{4 \text{ billion prescription equivalents} \times 40\%} = 0.125 \text{ lbs per prescription equivalent medicine}$$

The first equation results in an estimate that is 12 percent lower than that of the second equation. Given lack of source data for the estimates from the NCPA, and to offer a conservative estimate, the lower estimate of .111 pounds was used for the purpose of this study.

Using Average Prescription Weight to Calculate the Weight of Unwanted Pharmaceuticals Available for Collection

The following formula was used to calculate the denominator in the Collection Rate equation in Figure 1:

$$39.9 \text{ million units available for collection} \times 0.11 \text{ pounds} = 4.4 \text{ million pounds}$$

Data Limitations

The average weight of a medicine was derived from the *Get the Meds Out!* mail-back program. Of the medicines returned through the program, 85 percent were pills and 15 percent were other, heavier forms of medicine (e.g., ointments and liquids). However, it is possible that the ratio of pills to heavier medicines found in collected medicine samples is not representative of the ratio of pills to heavier medicines sold. Therefore, if the ratio of pills to other medicine forms collected is different from the ratio of those sold, the average weight of medicines collected would be different.

Appendix H: Collection Costs

This appendix provides additional information on the costs of operations and destruction, as well as the value of volunteer labor for municipally run take-back programs. The methodology and limitations of the data gathered are explained in subsequent sections of this appendix. Source data can be found in the accompanying spreadsheet.

Costs

Reported Costs of Permanent and One-Day Municipal Take-back Programs

Actual reported expenditures were \$267,200 in 2010 and \$276,600 in 2011. These totals do not include the costs of programs that were unable to provide cost data. In addition to actual expenditures, programs received donations and volunteer labor whose value is an estimated \$95,000 per year. Including the value of donations and volunteer labor, total reported program costs were \$362,200 for 2010 and \$371,600 for 2011. Some programs had access to no-cost disposal in 2010 and 2011. These no-cost disposal services are valued at \$56,600. If no-cost disposal had not been available, total reported program costs for 2011 would have been approximately \$428,200.

Table 1: Reported Program Costs for 2010 and 2011

Program Year	Reported Costs for Operations & Disposal	Value of Volunteer Labor and Donations	Value of Disposal Offered at No Cost	Estimated Total Program Cost
2010	\$267,200	\$95,000	\$56,600	\$418,800
2011	\$276,600	\$95,000	\$56,600	\$428,200

Derived Unit Costs per Pound, per Capita, and per Prescription Equivalent

Total derived per pound unit costs ranged from \$5.83 to \$7.14 per pound for programs that paid for disposal. Programs that had access to no-cost disposal paid between \$1.50 and \$1.25 less per pound for their programs, between \$4.30 and \$4.87 per pound. All programs received additional volunteer labor and donations, which were valued between \$2.22 and \$3.28 per pound.

Table 2: Unit Costs Range for Wisconsin Municipal Take-Back Program

Unit Costs	Per Pound		Per Capita		Per Medicine Collected		Per Medicine Sold in WI	
	Low	High	Low	High	Low	High	Low	High
Operations	\$4.30	\$4.87	\$0.07	\$0.08	\$0.48	\$0.54	\$0.003	\$0.004
Destruction	\$1.53	\$2.27	\$0.03	\$0.04	\$0.17	\$0.25	\$0.001	\$0.002
Volunteer	\$2.22	\$2.93	\$0.04	\$0.05	\$0.25	\$0.32	\$0.002	\$0.002
TOTAL	\$8.05	\$10.07	\$0.15	\$0.11	\$0.89	\$1.11	\$0.01	\$0.01

Total average program costs per pound, based on 2011 data, were \$9.06 per pound, \$0.15 per capita, and \$0.01 per prescription equivalent sold in the state. Average total program costs for permanent collections were lower than for one-day collections at \$8.33 per pound compared with \$9.51 on average. One-day collections were 8 percent more costly on a per pound basis than permanent collections in 2011. When the value of volunteer labor and donations are factored into the total “cost” of these programs, one-day collection programs are 14 percent more costly than permanent programs. Trends toward permanent collection programs in

Wisconsin reflect this difference in cost. However, it should be noted that the greatest difference in program costs in 2011 was disposal costs, which were 68 percent of the cost of one-day disposal costs. It is possible that permanent collection locations had greater access to no-cost disposal options and that, without these no-cost services, total program costs for permanent and one-day collections would be roughly equal.

Table 3: 2011 Average Costs per Pound by Cost Category

Collection Type	Initial/Fixed Cost	2011 Operation Costs / Pound	2011 Disposal Costs / Pound	2011 Total Cost per Pound Collected	2011 Value of Volunteers and Donations per Pound	2011 Total Cost / Pound Including Volunteer/Donations
Permanent	\$700	\$4.58	\$1.53	\$6.11	\$2.22	\$8.33
One-day	-	\$4.30	\$2.27	\$6.58	\$2.93	\$9.51

Value of Volunteer Labor and Donated Services and Materials

Many municipally operated collections relied heavily on donations of materials and services, as well as the volunteer labor of pharmacists, nurses, law enforcement officials, and others, to operate their collection programs. They also received donations of food, transportation, advertising and other operations materials. The total reported volunteer labor was approximately 2,629 hours, or about 2.5 to 6.25 minutes per pound collected.

The contribution of volunteer labor and donated services often significantly reduces the overall costs of a program. On average, volunteer labor accounts for one-third of program costs, but accounts for as much as 48 percent of some programs’ total costs.

Compared to permanent collection programs, one-day programs use more volunteer labor and cover a greater portion of their operating costs with volunteer labor and donations. On average, permanent and one-day collection programs in Wisconsin receive roughly 110 hours of volunteer labor annually. But one-day programs receive almost 129 percent more than permanent programs do.

Table 4: Volunteer Labor Hours for Permanent and One-Day Collection Programs

Collection Type	Average Hours of Volunteer Labor Received	2011 Volunteer Hours per Pound	Average Hourly Volunteer Rate
Permanent	62.4	0.044	\$50.00
One-day	143.2	0.103	\$33.00

Permanent collections are typically run by law enforcement officers who incorporate collection activities into regular hours. One-day collections, on the other hand, can be large in size and often need a volunteer labor force to plan, coordinate, promote, and operate. If volunteer labor and donations were calculated as part of operations costs, approximately 31 percent of one-day operation costs would be covered by volunteer labor while around 27 percent of permanent program costs would be covered by volunteers, based on 2011 figures. If volunteers were paid,

the operating costs of one-day collection programs would be 45 percent higher, while the operating costs of permanent locations would rise 36 percent.

It is worth noting that the average value of volunteer labor for one-day collections—around \$33.00 per hour—is lower than that for permanent collections. Permanent collections volunteers are often skilled nurses and pharmacists who help sort controlled and non-controlled medicines, and the average hourly value of volunteer labor was around \$50.00 per hour in 2011.

Operations Costs

Operations costs include materials and labor for planning, organizing, and operating the collection program. Costs depended on factors including program type, the amount of labor that was paid versus volunteer-based, and the quantity of donations received.

Operations costs varied dramatically from program to program due, in large part, to labor costs. While some programs used mainly volunteers, others—especially permanent police department collections—incorporated collection activities into their routine operations.

The quantity of drugs collected heavily influenced the per-pound cost of collection. Programs that were not able to achieve efficiency of scale had much higher costs per pound. For example, the Kewaunee County Sheriff's Department collected just 100 pounds of unwanted medication at around \$7.20 per pound for operations expenses, while Waukesha Medicine Collection Days program collected over 45 times the Kewaunee program's collections, resulting in a per pound cost of just \$4.51.

Disposal Costs

Disposal costs in 2011 ranged from \$1.53 per pound to \$2.27 per pound, on average. Per-capita costs were between \$0.03 and \$0.04, and costs per prescription were less than \$0.01. Disposal costs varied widely from program to program due to the availability of no-cost disposal options to some communities.

For example, the Fond du Lac Police Department paid \$2.07 per pound to dispose of unwanted pharmaceuticals in 2010. But in 2011, no-cost disposal was available through the DEA Take Back Days and the department paid nothing, thereby reducing program costs by \$3,425. Racine Medicine Collection Days, on the other hand, paid around \$1.55 per pound in both 2010 and 2011.

No-cost disposal through the DEA Take Back Days will likely cease once the agency issues its regulations regarding the collection of unwanted medications. There is no guarantee that other no-cost disposal options will be available in the future.

Because of no-cost disposal options, the total reported disposal cost of Wisconsin programs in 2011 is not an accurate representation of future disposal costs. Municipal programs that want to continue collections may have to pay for disposal when no-cost options are not available. If no-cost options had not been available in 2011, total disposal costs for Wisconsin municipal programs would have been \$140,200—68 percent higher than the reported costs of \$83,600, an increase of \$0.01 per capita, and a negligible increase in per-prescription costs.

Methodology

Permanent and One-Day Municipal Take-Back Programs

Reported Costs

The actual program expenditures for 2010 and 2011 are based on cash expenditures that were reported in the UW-Extension survey. Where disposal cost data were not reported, but pounds of collected medicines were, disposal costs were estimated by multiplying the pounds collected by the per-pound disposal rates quoted by Veolia Environmental Services. These estimated disposal costs were included in the actual program expenditures total in this study.

Value of Volunteer Labor and Donations

The total annual value of volunteer labor and donations is based on the reported data in the UW-Extension survey. The value of donations was taken directly from survey data. In cases where the value of volunteer labor was reported, these figures were used to in the calculation of the value of donations and volunteer labor. In cases where the value of volunteer labor was not reported, reported hours were multiplied by hourly rate data provided by Fond du Lac County.

$$\begin{array}{l} \text{Total Value of} \\ \text{Donations and} \\ \text{Volunteer Labor} \end{array} = \begin{array}{l} \text{Reported Donation Value} + \text{Reported Volunteer Value} + \\ \text{Reported Volunteer Hours} \times \text{Hrly Rate} \end{array}$$

Fond du Lac County rates are \$55 per hour for a pharmacist's time, \$26 per hour for the time of a law enforcement official, \$26-\$30 per hour for a nurse, and \$17.50 per hour for the time of additional municipal employees and other volunteers.

If programs were unable to report either the number of drugs collected or the number of hours donated in volunteer labor, data from those programs were excluded from unit value calculations for volunteer labor and donations.

Derived Unit Costs

Because many programs could not provide cost data, the total reported cost is not an accurate representation of the total costs of programs operating in Wisconsin. Therefore, per pound, per prescription and per capita costs were calculated.

The average unit costs for disposal were calculated using 2011 data from only the counties that were able to report both pounds collected and the cost of disposal. Programs that used no-cost disposal options were excluded from the average cost of disposal calculation.

$$\text{Per lb Cost of Disposal} = \frac{\text{Reported Costs from Programs with Complete Data}}{\text{Total lbs collected by Programs with Complete Data}}$$

$$\text{Per Capita Cost of Disposal} = \frac{\text{Per lb Cost of Disposal} \times \text{lbs Collected by Programs with Complete Data}}{\text{Wisconsin Population as of 2010 Census}}$$

$$\text{Per Rx/OTC Cost of Disposal} = \frac{\text{Per lb Cost of Disposal} \times \text{lbs Collected by Programs with Complete Data}}{\text{Estimated Units of Prescription and OTC Medicines Sold in Wisconsin}}$$

The average unit value for volunteer labor and donations was calculated using 2011 data from only the counties that were able to report both pounds collected and the value of volunteer labor and donations. Per capita costs were calculated using the Wisconsin population as of the 2010 U.S. census.

<i>Per lb Value of Volunteer Labor and Donations</i>	=	$\frac{\text{Reported Costs from Programs w/ Complete Data}}{\text{Total lbs collected by Programs with Complete Data}}$
<i>Per Capita Cost of Volunteer Labor and Donations</i>	=	$\frac{\text{Per lb Cost of Disposal} \times \text{lbs Collected by Programs w/ Complete Data}}{\text{Wisconsin Population as of 2010 Census}}$
<i>Per Rx/OTC Cost of Volunteer Labor and Donations</i>	=	$\frac{\text{Per lb Cost of Disposal} \times \text{lbs Collected by Programs with Complete Data}}{\text{Estimated Units of Prescription and OTC Medicines Sold in Wisconsin}}$

Data Limitations

Limitations of the data acquired through the UW-Extension study are primarily related to the quality of record-keeping among collection programs. But additional limitations stem from the data used to calculate per-prescription/OTC costs, as well as the scope of the UW-Extension study.

The UW-Extension study collected data only from municipally run collection programs. Other pharmaceutical collection programs, such as those run through private facilities like hospitals and pharmacies, were excluded from the study. These programs’ collection costs are unknown.

Data gathered through the survey are only as good as the record-keeping practices of the programs that participated in the study. Record-keeping practices varied dramatically from program to program: while some kept meticulous records (e.g., Fond du Lac County), others were able to provide only estimates of the costs incurred or no estimates at all.

Thus, the amount of data variation made it difficult to accurately compare the costs of one-day and permanent collection programs, with the most variability between disposal costs and the value of volunteer labor and donations.

Disposal costs varied because some programs had access to no-cost disposal, while others had to pay. Even among programs that paid for drug destruction services, the amount paid varied because of factors such as the distance that collected drugs had to be transported to destruction facilities and the addition of complementary services. Complementary services can include the presence of a witness to the destruction of the drugs, a law enforcement escort for the transportation of controlled substances, and collection bins. It is likely that, in some instances, transportation costs were not included in the cost of destruction.

The derived unit cost per prescription equivalent was calculated using the estimate for the total units of prescription and OTC equivalents sold in the state. The same limitations that affected the estimate of the total quantity of medicines sold in the state also affected the estimate for per-prescription cost.

As noted, the *Get the Meds Out!* pilot mail-back program was a research pilot and costs are not representative of a pure collection program. These costs cannot be used to benchmark the costs of a true mail-back collection program. The CVS and Walgreens mail back options, while a better estimate, are not comparable to the Wisconsin municipal program costs because they do not accept controlled substances—the key aspect of municipal collections that increases the program cost. Additionally, the cost estimate for the CVS and Walgreens option is based on the price for the consumer, not the cost for the program operator.

Appendix I: Educational Flier Distributed by Wisconsin Pharmacies

In May 2012, Wisconsin pharmacies began informing their customers about options for pharmaceutical waste reduction and disposal. Acting on a recommendation of the Wisconsin Pharmaceutical Waste Working Group and in partnership with DNR, the Pharmacy Society of Wisconsin distributed a flier for its member pharmacists to place on their counters or to insert in bags with prescription medications. See the flier here:



What can you do to help?

REDUCE pharmaceutical waste

- Talk to your pharmacist about your medications to ensure they are taken as prescribed by your practitioner.
- Only take medications that have been prescribed for your use.
- When trying a new medication, ask your doctor to prescribe a limited quantity to see if it will work for you.
- For more ideas, go to the DNR website <http://dnr.wi.gov> and search for "health care waste" then, under the Household Health Care Waste section, click on "Pharmaceuticals."

STORE and DISPOSE of pharmaceuticals properly

- Secure all medications to protect children and pets.
- Do not flush medications or burn them in burn barrels.
- Take your unwanted medications to a local medication collection. Ask your pharmacist for locations or search the Wisconsin list at <http://shwec.uwm.edu/collections/>
- If a local collection site is not available, remove or mark out personal information, mix with kitty litter or coffee grounds, seal in a container such as a coffee can, and dispose in the trash.
- Do not put sharps in the trash; this is illegal in Wisconsin. For disposal options, go to <http://dnr.wi.gov> and search for "health care waste", then under the Household section, click on "Medical sharps."



<http://library.constantcontact.com/download/get/file/1011293851033-1162/DNR+2012.pdf>

Appendix J: An Option for Wisconsin Take-Back Collection Data Reporting

The following forms were created to provide an option for gathering accurate, consistent and complete collected weight and cost data from Wisconsin unwanted pharmaceutical take-back programs.

One-Day Collections

Collection Location Name:

Collection Location Address:

Collection Date ___/___/_____

Amount of Collected Drugs (if they are not sorted, please enter just the total):

	Controlled Substances	Non-Controlled Substances	Total
Weight (lbs)			
# of Prescriptions			
Average % of Prescriptions Leftover			

Disposal Company or Waste Hauler:

Destination of Waste Drugs:

Program Costs and Values:

Paid and Volunteer Labor:

	Paid Labor			Volunteer Labor		
	Hours	Hourly Rate	Total Cost	Hours	Hourly Rate	Total Value
Law Enforcement						
Health Care Workers						
Additional Employees						
Other:						

Additional Purchases and Donations:

	Cost	Value of Donation
Radio Advertising		
TV Advertising		
Online Advertising		
Newsletter Advertising		
Newspaper Advertising		
Flier Advertising		
Other Advertising		
Materials – Boxes, Drums, Tape, Etc.		
Additional Materials:		

Funding for this Collection Comes From: _____

Permanent (Ongoing) Collections

Collection Location Name:

Collection Location Address:

Reporting from Dates: ___/___/_____ to ___/___/_____

Amount of Collected Drugs (if they are not sorted, please enter just the total):

	Controlled Substances	Non-Controlled Substances	Total
Weight (lbs)			
# of Prescriptions			
Average % of Prescriptions Leftover			

Disposal Company or Waste Hauler:

Destination of Waste Drugs:

Program Costs and Values:

Paid and Volunteer Labor:

	Paid Labor			Volunteer Labor		
	Hours	Hourly Rate	Total Cost	Hours	Hourly Rate	Total Value
Law Enforcement						
Health Care Workers						
Additional Employees						
Other:						

Additional Purchases and Donations:

	Cost	Value of Donation
Radio Advertising		
TV Advertising		
Online Advertising		
Newsletter Advertising		

Wisconsin Household Pharmaceutical Waste Collection – Challenges and Opportunities

Newspaper Advertising		
Flier Advertising		
Other Advertising		
Materials – Boxes, Drums, Tape, Etc.		
Additional Materials:		

Drop Box Cost (Disregard if this has been previously reported):

\$ _____

Purchased ___ Donated ___

Funding for this Collection Comes From: _____

Appendix K: Alternatives for Disposal, Collection, Funding, and Public Education

Disposal – Additional Information

Most pharmaceutical take-back programs across the U.S., Canada, and abroad destroy unwanted household pharmaceuticals through high temperature incineration or a comparable practice. However, some U.S. entities still tout landfill disposal as a safe alternative to flushing medicines down the drain.^{xi} Two options for landfill disposal are currently supported in the U.S.: SMARxT Disposal™ and MedsAway™.

- SMARxT Disposal, is a system developed by a private-public partnership between the U.S. Fish and Wildlife Service, the American Pharmacists Association, and the Pharmaceutical Research and Manufacturers of America. They recommend that consumers mix liquid and solid medications in a sealable plastic bag, or to add water to solid medications, to dissolve them. Then, consumers should add cat litter, coffee grounds, or saw dust to the mixture to make it unappealing to someone trying to steal the drugs from the trash. The bag should be sealed and thrown in the garbage.^{xli}
- Apothecary Products, Inc.[®] has recently started promoting a carbon pouch, called MedsAway™, which the company claims “neutralizes” almost all pharmaceuticals. Per the product’s instructions, solid, liquid, patch, and other medications are to be placed in the bag with water. The bag is then sealed and thrown out with the trash.

Though these practices are not illegal, they do not guarantee that active pharmaceutical ingredients will not make their way into water sources the way that high temperature incineration does. Bags can break, especially in the trash removal process, and release pharmaceuticals into the environment. Active pharmaceutical ingredients have been found in landfill leachate, which typically goes to a wastewater treatment plant for processing. Unfortunately, technology that would remove pharmaceutical agents from wastewater does not exist.^{xlii} Therefore, sending unwanted medicines to the landfill may not prevent pharmaceuticals from entering water bodies, regardless of how they are prepared and bagged before disposal.

Collection Systems – Additional Information

The most common systems for collection are In-Pharmacy Collection, Drop-Boxes (often in Police Stations), and Mail-Back programs.

Regardless of the collection system design, certain attributes have consistently been tied to program success:

- **Convenience.** Programs must be convenient and easily accessible to maximize consumer participation. Convenience can be assessed by the distance a person needs to travel to get to the collection site, the hours of operation at the site, and the site’s proximity to other frequently visited locations, such as the pharmacy, supermarket, and post office. The level of anonymity provided to the consumer might also be considered an attribute of convenience.
- **On-going availability.** Daily or even around-the-clock access to a collection site is an important component of a successful take-back system. In fact, a recent study on electronic waste collection sites found that collection rates correlated with the number of days a collection site was open.^{xliii}

- **No cost for consumers.** Consumer fees for pharmaceutical return discourage consumer participation and result in lower program participation rates.^{xliv}
- **Minimal travel to incineration location.** The distance between home and the collection site, and the collection site and the destruction site should be as short as possible to minimize environmental impacts associated with transportation.
- **Secure storage of returned drugs.** Safety is a primary motivation for establishing drug take-back programs. Programs should ensure the safe storage of medicines until they can be destroyed so the drugs don't end up in the hands of abusers.
- **Promotion, Education, Outreach.** Consistent messaging and uniform program operation are essential for increasing participation and collection levels.

COLLECTION OPTIONS	Minimizes Environmental Impacts	Lowers Costs	Provides Consumer Convenience	On-going Availability	High Participation Rates	Business Opportunities
Pharmacy Collection	✓	✓	✓	✓	✓	✓
Secure Drop Box Collection	✓	✓	✓	✓	✓	
One-Day Collection						
Mail Back Collection	✓		✓	✓	✓	✓

Sustainable Funding

Take-back programs are funded in numerous ways. Funding sources should be sustainable and cover the full costs of take-back, transportation, destruction, public education, and promotion. Funding sources linked to sales, such as producer responsibility programs, ensure the availability of funds regardless of fluctuations in consumption rates. Below are examples of some funding structures that are currently in use:

FUNDING OPTIONS	Provides Sustainable Funding	Covers All Program Costs	Funding Linked to Sales Volumes	No Cost to Consumers	High Participation Rates
Consumers					
Drug Possession Fees				✓	
Grants – Federal, State, Private				✓	
Pharmacies	✓	✓	✓	✓	✓
Producers/Manufacturers	✓	✓	✓	✓	✓
Public Agencies/Taxpayers				✓	

Program Case Studies and Comparisons

Many producer responsibility systems have been the most sustainable for funding collection operations. Below are some case studies, followed by comparison chart:

- Sweden.** Sweden’s national producer responsibility legislation requires all those who conduct retail trade of medicines (e.g. pharmacies) to take full financial and logistical responsibility for the take-back of household-generated pharmaceutical waste; for the safe storage and handling of the pharmaceutical waste; and public education about the take-back program.

Each pharmacy’s responsibility is limited, however, to the amount of pharmaceuticals that it sells, and it does not include the take-back of hazardous waste. It is unclear who pays for the transportation and destruction of the collected medication, although the law does specify that municipalities are not responsible for the transportation and treatment of pharmaceutical waste.^{xlv}

While not obligated by law, other stakeholders participate in reducing pharmaceutical waste and promoting awareness of the pharmaceutical take-back program. For example, the Swedish Medical Products Agency (Läkemedelsverket) has included in its 2012 national medicine strategy a project to reduce pharmaceutical waste.^{xlvi} The project is co-funded by over 10 organizations including, the Swedish Waste Management Trade Organization (Avfall Sverige), the Swedish Environmental Protection Agency (Naturvårdsverket), the Swedish Medical Products Industry Association (Läkemedelsindustriföreningen), the Swedish Pharmacy Association (Sveriges Apoteksförening), and the Swedish Grocery Trade Organization (Svensk Dagligvaruhandel). The project is investigating the reasons that households discard drugs and then campaigning to increase consumer participation in the pharmaceutical take-back program.

- British Columbia, Canada.** The producer responsibility law in Canada requires that producers manage and fund pharmaceutical take-back programs. Producers are financially responsible for the collection, storage, transportation, destruction, and development of public awareness campaigns.^{xlvii} While brand-owners are obligated to

pay for public education, they are not obligated to actively campaign for public awareness. PCPSA coordinates the funding of the take-back program and charges brand-owners based on market share. Because OTC medicines account for roughly 20 percent of returned medicines, producers of OTC medicines pay a smaller contribution to program costs than prescription medicine producers do. Producers with less than 1 million CAD in annual net sales pay a minimum of 200 CAD per year. PCPSA reports that they receive enough payment from brand-owners to sustain the program.^{xlvi}

- **France.** Cyclamed is a nonprofit organization founded by professionals involved in the drug supply chain (dispensing pharmacists, wholesale distributors, and drug companies). Cyclamed collects expired and non-expired unused drugs, which patients bring back to the pharmacies for disposal and energy recovery. Cyclamed's collection and disposal operations are funded in part by manufacturers based on sales volumes and in part by cash reimbursements from Adelphe, a recycling company, for pharmaceutical packing returned to them by Cyclamed. Pharmacists participated in the program voluntarily until 2009 when their participation became law^{xlix}, but they do not fund the program directly.
- **San Francisco, California.** San Francisco was considering a product stewardship ordinance; however, industry opposed a producer obligation to fund the program. To avoid the ordinance, industry (PhRMA, an industry trade group, and Genentech, which is based in South San Francisco) voluntarily funded the City's pilot project. PhRMA donated \$100,000, while Genentech donated \$10,000.ⁱ Since these payments were one-time donations, however, this program is not sustainably funded. While national chains refused to participate, eleven local pharmacies do—two of which can accept both controlled and non-controlled substances. All police stations accept both controlled and non-controlled pharmaceutical waste.ⁱⁱ The city has also distributed envelopes to residents so that they can mail their pharmaceuticals directly to a consolidator for incineration. However, the city plans to cease the mail-back program soon because it is too costly.ⁱⁱⁱ
- **Alameda County, California.** Public agencies fund the current collection program in Alameda County. In July, 2012, a producer responsibility ordinance was passed and producers (brand-owners) will soon fund and manage a take-back program, as well as public education and promotion of the program. Producers will also pay an oversight fee to the County. Non-complying companies will be fined up to \$1,000 per day.^{liii}
- **Colorado.** The pilot project in Colorado is co-funded by a collection of public agencies, as well as King Sooper and City Market, two retail pharmacy chains that are participating in the program.^{liv} Funding from a diversity of public agencies is more sustainable than funding from just one; however, this model is still less sustainable than a product stewardship model because the funding is not tied to sales.
- **Illinois.** In 2011, Illinois passed the Illinois Safe Pharmaceutical Act that allows police departments and other government buildings, such as city halls, to have secure drop-boxes to collect pharmaceutical waste.^{lv} Illinois has a unique funding model that allocates drug possession fees to the pharmaceutical take-back program. At \$20 per infraction, this funding model is expected to bring in \$100,000 to \$200,000 of revenue per year.^{lvi} However, this revenue is not enough to cover the costs of a statewide program in Illinois. It would likely not even cover just the disposal costs. In 2011,

British Columbia's PCPSA paid 150,000 CAD just for final disposal of the pharmaceutical waste. In addition, they paid for transportation, educational materials, administration, etc.^{lvii} Illinois likely has higher expenses than British Columbia; Illinois' population is just under 3 times that of British Columbia's.^{lviii}

- **Iowa.** Legislation passed in Iowa in 2009 called for the creation of a community pharmacy-based "pharmaceutical collection and disposal pilot program." The Iowa Department of Natural Resources awarded grant funds to the Iowa Board of Pharmacy, which worked closely with the Iowa Pharmacy Association to offer the *TakeAway* pilot program. State funding was also approved by the legislature in 2010. This program has partnership with industry, but is government funded.
- **Pharmacies Nationwide.** Walgreen's Pharmacy offers a mail-back program run by Sharps Compliance. Consumers can buy a pre-paid envelope for \$3.99 and mail it to Sharps Compliance for incineration.^{lix} Pharmacies at Safeway and Kaiser offer similar mail-back programs.^{lx}

Wisconsin Household Pharmaceutical Waste Collection – Challenges and Opportunities

Program	Collection Point	Materials Accepted	Other Accepted Materials	Operating Agency	Funding Sources	Education and Outreach	Destruction	Year Started	Law, Voluntary, Pilot
Sweden	Pharmacies	Controlled and Non-controlled. OTC and Rx	Medical Sharps	Pharmacies	Pharmacies	Pervasive. Also provides plastic bags in which to package pills, and containers in which to collect sharps. ⁱ	High Temperature Incineration		Producer Responsibility Law
France ⁱⁱ	Pharmacies	Controlled and Non-controlled. OTC and Rx	None	Producers, Pharmacies	Producers, Sales of Recyclable Material from Packaging, Waste-to-Energy Credits	15% of budget spent on promotion	Waste-to-Energy Facilities	1993	Producer Responsibility Law
British Columbia	Pharmacies	Controlled and Non-controlled. OTC and Rx	None	Producers, Pharmacies, Government Oversight	Producers/Industry	15% of budget spent on outreach ⁱⁱⁱ	High Temperature Incineration and Waste-to-Energy	1999	Producer Responsibility Law
San Francisco, CA ^{iv}	Local Pharmacies, Police Stations, Mail-Back (temporarily)	Controlled and Non-controlled. OTC and Rx	Empty inhaler packages. Recology offers sharps collection through Walgreens in San Francisco. ^v	SF Environment (Government)	One-time donations from PhRMA and Genentech (Industry)	Almost 50% of the budget is allocated to outreach and promotion	High Temperature Incineration or Comparable	2011	Pilot
Alameda County, CA ^{vi}	Law doesn't specify. Before law: HHW sites, hospitals, pharmacies, Sheriff's offices, government buildings.	Controlled and Non-controlled. RX Only	None	Producers w/ Government Oversight	Producers/Industry	Included by Law	High Temperature Incineration or Comparable	2012	Producer Responsibility Law
Colorado ^{vii}	9 pharmacies, 3 hospitals, 11 drop boxes, 1 per city with 2 in Denver.	Non-controlled only. OTC and Rx	None	Colorado Department of Public Health and Environment	Taxpayers, Retail Pharmacies (Soooper and City Market)	Some	High Temperature Incineration or Comparable	Through 2012	Pilot
Illinois ^{viii}	Police Departments, Government Buildings, Secure Drop Boxes	Controlled and Non-controlled. OTC and Rx	None	Iowa Police Departments and Governments	Drug Possession Fees	Some	High Temperature Incineration or Comparable	2011	Law, but not a producer responsibility law
Iowa ^{ix}	Pharmacies	Controlled, Non-controlled. OTC and Rx	None	Iowa Pharmacy Association, Iowa Board of Pharmacy, Iowa Department of Natural Resources	Government Grants/Taxpayers	Some	High Temperature Incineration or Comparable	2009	Law, but not a producer responsibility law
Walgreens & CVS ^x	Mail-Back – Envelope Pick up at Chain Pharmacy Stores	Non-controlled only. OTC and Rx	None	Sharps Compliance, Walgreens, CVS	Consumers	Some	High Temperature Incineration	2010	Voluntary

ENDNOTES

II. Introduction

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APPENDIX E: PHARMACEUTICAL SALES IN WISCONSIN

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