

# Managing Access to Dextromethorphan

## Cost Implications of a Potential Over-the-Counter to Prescription-Only Conversion

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October 2016

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## Executive Summary

There are approximately one billion cases of the common cold each year in the U.S.<sup>1</sup> Adults average two to three colds per year, and children average even more.<sup>2</sup> Not surprisingly, coughs and colds are the most common illness in humans.<sup>3</sup> While a cold usually clears up within seven to 10 days, its symptoms can be disruptive. Treatment options include a variety of over-the-counter (“OTC”) and prescription (“Rx”) medications.<sup>4</sup> However, more than half of patients purchase nonprescription (OTC) drugs.<sup>5</sup> From mid-2014 to mid-2015, patients spent about \$2 billion per year on OTC drugs to treat their cough symptoms.<sup>6</sup>

The majority of OTC cough medicines contain an active ingredient called dextromethorphan (“DXM”). DXM is the preferred OTC cough medication but is also subject to abuse by minors, which has raised concerns among policy-makers. In response to this, 12 states currently prohibit the sale of DXM OTC medicines to under-18 patients.<sup>7</sup> Although the Food and Drug Administration (“FDA”) considered scheduling DXM as a controlled substance, an FDA advisory committee ultimately voted against this proposal due to the benefits of OTC access to DXM.<sup>8</sup>

Government officials have tried to balance the positives of OTC access against the negatives of potential abuse. This paper aims to inform this discussion by quantifying various costs that would result if products with DXM were converted from OTC to Rx. Included are the costs of incremental physician visits, of having to miss work while going to the physician’s office, of

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<sup>1</sup> “Common Cold,” MedlinePlus, (“MedlinePlus”), <https://www.nlm.nih.gov/medlineplus/commoncold.html>.

<sup>2</sup> “Common Colds: Protect Yourself and Others,” Centers for Disease Control and Prevention, (“CDC”), <http://www.cdc.gov/features/rhinoviruses/>.

<sup>3</sup> See MedlinePlus.

<sup>4</sup> DXM medications are used to treat cough arising from a variety of illnesses, including bronchitis. However, the drug is used most often to help relieve cough/common cold symptoms. See Ross H. Albert, “Diagnosis and Treatment of Acute Bronchitis,” *American Family Physician*, 82 (11), December 2010 (“Albert 2010”).

<sup>5</sup> It has been estimated that approximately 60% of the instances of coughs and colds are treated with OTC drugs. See “Self-Medication and Allergies Survey,” National Council on Patient Information and Education, January 2008, (“Self-Medication Survey”), <http://www.bemedwise.org/survey/ExecutiveSummary.pdf>.

<sup>6</sup> Information Resources, Inc. Infoscan (“IRI Infoscan”) Data on Dollar and Unit Sales for Over-the-Counter Cough Medicine, Total U.S. - Multi Outlet, four-week period ending June 10, 2013 through four-week period ending July 12, 2015, (“IRI Data”); see also **Exhibit A**.

<sup>7</sup> “Dextromethorphan: Preventing Teen Cough Medicine Abuse,” Consumer Healthcare Products Association (“CHPA”), (“CHPA Website”), <http://www.chpa.org/dex.aspx>.

<sup>8</sup> “Summary Minutes of the Drug Safety and Risk Management Advisory Committee,” FDA, September 14, 2010, (“FDA 2010”), p. 5, <http://www.fda.gov/downloads/AdvisoryCommittees/CommitteesMeetingMaterials/Drugs/DrugSafetyandRiskManagementAdvisoryCommittee/UCM235010.pdf>.

higher DXM drugs prices under Rx availability, and of switching to alternative medication that may be more expensive. Based on a natural experiment of another OTC product that was converted to Rx status, prescription-only access to DXM would generate incremental costs between \$21 and \$31 billion for the period 2016 – 2025.

## Introduction

There are approximately one billion cases of the common cold each year in the U.S.<sup>9</sup> Adults average two to three colds per year, and children average even more.<sup>10</sup> Not surprisingly, coughs and colds are the most common illness in humans.<sup>11</sup> While a cold usually clears up within seven to 10 days, its symptoms, including coughing, can be disruptive. Treatment options include a large variety of over-the-counter (“OTC”) and prescription (“Rx”) medication.<sup>12</sup> However, more than half of patients purchase nonprescription drugs;<sup>13</sup> from mid-2013 to mid-2015, patients spent about \$2 billion per year on OTC drugs to treat their cough symptoms.<sup>14</sup>

The majority of OTC cough medicines contain an active ingredient called dextromethorphan (“DXM”). DXM is the preferred OTC cough medication but is also subject to abuse by minors, which has raised concerns among some policy makers. Government officials have tried to balance the positives of OTC access against the negatives of potential abuse. This paper aims to inform this discussion by quantifying various costs that would result if products with DXM were converted from OTC status to that of a controlled substance. For the purposes of this analysis, we consider the market availability of a controlled substance to be similar to a prescription (Rx) product. Included are the costs of incremental physician visits, of having to miss work while going to the physician’s office, of higher DXM drugs prices under Rx availability, and of switching to alternative and possibly more expensive medication.

## Cough and the common cold

### *Health consequences and discomfort*

A common cold is usually harmless, but its symptoms—a cough, sore throat, runny nose, and fatigue—can be unpleasant. Fully recovering from a cold and its related symptoms can take 15 to

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<sup>9</sup> See MedlinePlus.

<sup>10</sup> See CDC.

<sup>11</sup> “Common Cold,” PubMed Health, <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMHT0024671/>.

<sup>12</sup> DXM medications are used to treat cough arising from a variety of illnesses, including bronchitis. However, the drug is used most often to help relieve cough/common cold symptoms. See Albert 2010.

<sup>13</sup> It has been estimated that approximately 60% of the instances of coughs and colds are treated with OTC drugs. See Self-Medication Survey.

<sup>14</sup> See IRI Data and **Exhibit A**.

18 days.<sup>15</sup> However, a particularly bad cold can spread through the respiratory system and cause more serious problems. Very rarely, a cold can even expose the respiratory system to complications such as pneumonia.<sup>16</sup>

#### *Productivity and other economic consequences*

Costs due to discomfort are abstract, but the cost due to lost productivity caused by a cold is tangible. A number of studies have suggested that colds reduce hand-eye coordination, memory, and mental processing. Over 90% of cold sufferers in a related 2015 survey reported difficulty sleeping, and almost half of them claimed to have missed work or school during a cold. Reportedly, average productivity decreased by approximately 26.4%.<sup>17</sup>

The literature on health-related productivity losses primarily focuses on chronic conditions, but several articles look at acute conditions, like coughs and the common cold, recognizing that acute conditions “have the potential to cause substantial health-related productivity losses because of their high prevalence in working-age” adults.<sup>18</sup> Bramley et al. 2002 estimate that the economic costs associated with cold episodes in the U.S. are \$25 billion per year. This includes working adults in the U.S. who experience productivity declines due to suffering from a cold or caring for a child with a cold.<sup>19</sup>

#### OTC cough medicines

A cough is the most common symptom for which Americans self-medicate.<sup>20</sup> In general, most OTC cough and cold medicines are some permutation of similar ingredients, including<sup>21</sup>

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<sup>15</sup> “Common Colds, Overview,” PubMed Health, April 23, 2014, (“PubMed Health Overview”), <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0072727/>.

<sup>16</sup> See PubMed Health Overview; see also “Pneumonia,” PubMed Health, June 1, 2014, <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0063028/>.

<sup>17</sup> P.V. Dicipinigaitis et al., “Impact of cough and common cold on productivity, absenteeism, and daily life in the United States: ACHOO Survey,” *Current Medical Research and Opinions*, 31 (8), 2015.

<sup>18</sup> Thomas J. Bramley et al., “Productivity Losses Related to the Common Cold,” *Journal of Occupational and Environmental Medicine*, 44 (9), 2002, (“Bramley et al. 2002”), p. 822.

<sup>19</sup> See Bramley et al. 2002 at pp. 822, 828.

<sup>20</sup> A 2008 study found that 56% of adults with a cold treat it with an OTC medicine. See Self-Medication Survey.

<sup>21</sup> James Hamblin, “The Cold-Medicine Racket,” *The Atlantic*, December 19, 2014, <http://www.theatlantic.com/health/archive/2014/12/dayquil-screed/383768/>.

- (a) An internal analgesic that relieves pain and reduces fever;
- (b) A decongestant that relieves nasal congestion;<sup>22</sup>
- (c) An antitussive that reduces the number of times people cough;
- (d) An antihistamine that helps alleviate symptoms (runny nose, itchy or watery eyes, and sneezing) by blocking allergic reactions whenever a cough is the result of an allergy, or to relieve runny nose or sneezing in colds;<sup>23</sup> and/or
- (e) An expectorant that helps thin mucus to make it easier to cough up.<sup>24</sup>

Table 1 describes each category and gives some common examples:

Table 1: Common Ingredients in Cough Medications<sup>25</sup>

Type	Active Ingredient Examples	Effect	Brand Examples
Internal Analgesics	Acetaminophen	Relief of headache, fever, minor aches and pains	Tylenol <sup>®</sup>
Nasal Decongestants	Pseudoephedrine, phenylephrine	Relieve congestion by shrinking swollen blood vessels	Sudafed <sup>®</sup> , Afrinol <sup>®</sup> , Dimetapp <sup>®</sup> DM
Cough Suppressants	DXM, diphenhydramine, chlorphedianol, low-dose codeine <sup>26</sup>	Reduce the need to cough; inhibits cough reflex	Vicks <sup>®</sup> 44 Cough Relief, Mucinex <sup>®</sup> DM, Nudexta <sup>®</sup>
Antihistamines	Brompheniramine, chlorpheniramine, diphenhydramine, doxylamine	Inhibit effect of allergens; relieve runny nose and sneezing, or itchy, watery eyes	Vicks <sup>®</sup> Nyquil Severe, Coricidin <sup>®</sup> Multi-Symptom Cold, Benadryl <sup>®</sup>
Expectorants	Guaifenesin	Thin mucus, making it easier to cough up	Mucinex <sup>®</sup> , Flowtuss <sup>™</sup> , Obredon <sup>™</sup>

<sup>22</sup> "Antihistamines, Decongestants, and Cold Remedies," American Academy of Otolaryngology—Head and Neck Surgery, ("Antihistamines"), <http://www.entnet.org/content/antihistamines-decongestants-and-cold-remedies>.

<sup>23</sup> Decongestants such as pseudoephedrine shrink swollen blood vessels and tissues, relieving congestion. An antihistamine can help alleviate symptoms by blocking allergic reactions if allergies are the cause of congestion or cough. See "Understanding Treatment of the Common Cold," WebMD, <http://www.webmd.com/cold-and-flu/understanding-common-cold-treatment>; See also Antihistamines. Some older antihistamines are used to relieve runny nose or sneezing symptoms in colds. See "Cold, Cough, Allergy, Bronchodilator, and Antiasthmatic Drug Products for Over-the-Counter Human Use; Reopening of the Administrative Record for Antihistamine Drug Products" FDA, Federal Register, 65 (166), August 25, 2000, <https://www.gpo.gov/fdsys/pkg/FR-2000-08-25/pdf/00-21758.pdf>.

<sup>24</sup> "Expectorants," Drugs.com, <http://www.drugs.com/drug-class/expectorants.html>.

<sup>25</sup> See Drugs.com; "Drugs@FDA," FDA, <https://www.accessdata.fda.gov/scripts/cder/drugsatfda/>. Also note that many products combine these different types of ingredients.

<sup>26</sup> Codeine is Rx only unless in combination, in which case there is limited availability without a prescription in many states.

## Dextromethorphan and alternative cough suppressants

The FDA has approved four oral ingredients for use in OTC medicines for temporary cough suppression: DXM, low dose codeine,<sup>27</sup> diphenhydramine, and chlophedianol.<sup>28</sup>

- (a) Codeine is considered by some sources to be the “gold-standard” cough suppressant, but it is a scheduled controlled substance and only available with a prescription in most states.<sup>29</sup>
- (b) Diphenhydramine is an antihistamine that, although used to help relieve cough and allergy symptoms, is also sometimes used as a sleep-aid due to its sedating effect.<sup>30</sup>
- (c) Chlophedianol used to be available OTC on the U.S. market but has been discontinued.<sup>31</sup>
- (d) In light of the limitation of the other suppressants, DXM is the preferred OTC cough suppressant.<sup>32</sup> DXM provides temporary relief of cough symptoms; several studies have shown that DXM reduces the cough count, frequency, effort, and intensity in adults.<sup>33</sup> Additionally, DXM, used in appropriate doses, has relatively few side effects when compared to other cough and cold products. Accordingly, sales data show that DXM-containing medicines account for about 90% of all OTC cough suppressants sold in the U.S.:

<sup>27</sup> Low-dose codeine cough syrup in combination with other active ingredients are classified as Schedule V drugs, which some states will sell without a prescription with certain restrictions. See “Controlled Substances by CSA Schedule,” U.S. Drug Enforcement Agency (“DEA”), [http://www.deadiversion.usdoj.gov/schedules/orangebook/e\\_cs\\_sched.pdf](http://www.deadiversion.usdoj.gov/schedules/orangebook/e_cs_sched.pdf). Substances are placed on a Schedule based on their abuse potential and likelihood of causing dependence. Scheduled drugs range from being illegal (Schedule I) to having restrictions on their availability (Schedules II-V). Conventional drugs (e.g., antihypertensives or antidepressants), are not typically scheduled. Such restrictions include limits on the number of prescriptions an individual can receive, which physicians can prescribe a certain drug, and record-keeping, among other regulations. Schedule V substances have a low potential for abuse relative to other scheduled drugs, and consist primarily of preparations containing limited quantities of certain narcotics. Examples of codeine-containing Schedule V drugs include Robitussin AC and Phenergan with Codeine. See “Controlled Substance Schedules,” DEA, <http://www.deadiversion.usdoj.gov/schedules/>.

<sup>28</sup> In order to be approved by the FDA, a drug must pass certain safety and efficacy tests. See “Development & Approval Process (Drugs)” FDA, <http://www.fda.gov/Drugs/DevelopmentApprovalProcess>; I.M. Paul, “Therapeutic options for acute cough due to upper respiratory infections in Children,” *Lung*, 190 (1), February 2012, <http://www.ncbi.nlm.nih.gov/pubmed/21892785>.

<sup>29</sup> McMahon Wicker and Brice Labruzzo, “Antitussives,” *Medscape*, [http://www.medscape.com/viewarticle/704759\\_5](http://www.medscape.com/viewarticle/704759_5).

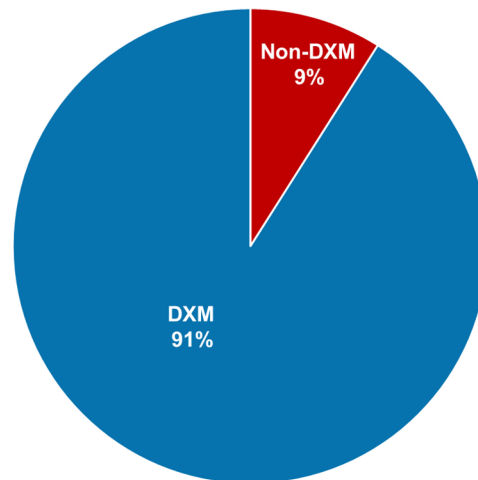
<sup>30</sup> “Diphenhydramine,” *Drugs.com*, <http://www.drugs.com/diphenhydramine.html>.

<sup>31</sup> Chlophedianol is an OTC drug with very limited marketing experience and is not currently available in the U.S. See “Briefing Book for the Meeting of the FDA Drug Safety and Risk Management Committee,” CHPA, September 14, 2010 (“CHPA 2010”), p. 15; “Chlophedianol,” *Human Metabolome Database*, <http://www.hmdb.ca/metabolites/HMDB15585>.

<sup>32</sup> “Dextromethorphan,” *Drugs.com*, <http://www.drugs.com/dextromethorphan.html>; see also CHPA 2010 at p. 15.

<sup>33</sup> “Over-the-Counter Medications for Acute Cough Symptoms,” *American Family Physician*, 78 (1), July 2008.

Chart 1: Share of Over-the-Counter Cough Medicines in 2014<sup>34</sup>



### *DXM abuse*

DXM has a long history of safety and effectiveness when used as directed.<sup>35</sup> However, those who exceed the recommended dosage can experience hallucinogenic states similar to those created by drugs like ketamine and phencyclidine. Users describe dose-dependent “plateaus” that range from a mild stimulant effect with distorted visual perceptions to a feeling of complete dissociation from one’s body. Other physical effects resulting from abuse or overdosing include nausea, panic attacks, sweating, hyperactivity, vomiting, paranoia, and tactile hallucinations.<sup>36</sup> These side-effects lower the drug’s overall dependence potential.<sup>37</sup>

Due to its low cost and availability without a prescription, DXM is most commonly abused by teenagers and young adults.<sup>38</sup> Although still abused at higher rates than cocaine, ecstasy, LSD,

<sup>34</sup> This pie chart summarizes DXM unit and dollar shares in 2014 (see **Exhibit A**). Both solid and liquid DXM medication are available in the U.S. Between July 2014 and July 2015, 55% of DXM drug expenditures were accounted for by liquid forms. See IRI Data.

<sup>35</sup> Based on information from the Code of Federal Registries, recommended use is 10 to 20 mg every four hours, 30 mg every six to eight hours, or 60 mg every 12 hours (21 CFR 341.74(d) (2015)).

<sup>36</sup> “Dextromethorphan (DXM),” Center for Substance Abuse Research (“CESAR”), <http://www.cesar.umd.edu/cesar/drugs/dxm.asp>.

<sup>37</sup> Jeannie Melick-Shield et al., “Dependence risk with chronic dextromethorphan abuse,” *Current Psychiatry*, 4 (2), February 2005, <http://www.currentpsychiatry.com/home/article/dependence-risk-with-chronic-dextromethorphan-abuse/022441893fd1d4a8b2d4041265ac967a.html>.

<sup>38</sup> Johnny Patout, “The Relationship between DXM and Street Drugs,” Stop Medicine Abuse, January 10, 2013, <http://stopmedicineabuse.org/blog/details/the-relationship-between-dxm-and-street-drugs>.



and methamphetamine,<sup>39</sup> annual DXM abuse rates reported by 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> graders have fallen more than 40% in nine years, from 5.4% in 2006 to 3.1% in 2015.<sup>40</sup>

### DXM policy background

While Federal legislation aimed at curbing DXM abuse has not yet passed, individual states have taken action to limit its misuse. In 2012, California became the first state to prohibit sales of DXM-containing OTC medicines to minors. They were soon followed by New York, Arizona, Louisiana, Virginia, Tennessee, Kentucky, Washington, New Jersey, Florida, Alaska, and Delaware.<sup>41</sup> Some bills proposed alternative DXM restrictions; for example, a Maryland Bill proposed that anyone who buys a product containing DXM must show a government-issued ID and sign a log or receipt. This Bill also proposed limiting DXM purchases to 3.6 grams in a 30-day period.<sup>42</sup> Similarly, a New York Bill proposed requiring stores to record all DXM purchases in a log and keep DXM medications away from direct access or behind the counter.<sup>43</sup>

Citing the benefits of OTC medicines containing DXM, an FDA advisory committee in 2010 voted against a proposed controlled substance scheduling, which could have effectively moved these products to a prescription status.<sup>44</sup> These benefits include fewer physician visits, lower drug costs (comparing OTC to prescription versions), and improved worker productivity.

In this line of research, the present paper quantifies the benefits associated with OTC access of DXM, specifically looking at foregone physician visits and lower OTC prices, and aims to increase the visibility of indirect cost-savings from OTC access. Both direct and indirect costs are important considerations for policy development.

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<sup>39</sup> R. Morgan Griffin, "Teen Abuse of Cough and Cold Medicine," WebMD, June 14, 2012, <http://www.webmd.com/parenting/teen-abuse-cough-medicine-9/teens-and-dxm-drug-abuse?page=1>.

<sup>40</sup> Johnston, L. D. et al., "Use of ecstasy, heroin, synthetic marijuana, alcohol declined among US teens in 2015," University of Michigan News Service, December 16, 2015, Table 15, <http://monitoringthefuture.org/data/15data/15drtbl15.pdf>.

<sup>41</sup> See CHPA Website.

<sup>42</sup> "Dextromethorphan (DXM) – State Statutes and State Legislation," National Alliance for Model State Drug Laws, June 8, 2007, <http://www.namsdl.org/library/1BA99246-19B9-E1C5-319E9CED29BA84C7/>. The maximum daily dose is 120 mg of DXM per day (21 CFR 341.74(d) (2015)) or 3.6 grams per 30-day period (120 mg × 30 days = 3,600 mg).

<sup>43</sup> "Bill No. A09601A," New York State Assembly, March 20, 2012, [http://assembly.state.ny.us/leg/?default\\_fld=&bn=A09601&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y](http://assembly.state.ny.us/leg/?default_fld=&bn=A09601&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y).

<sup>44</sup> See FDA 2010 at p. 5.

## Methodology

The value of OTC availability of products containing DXM is evaluated using a counter-factual approach. This method estimates the change in stakeholder value between two alternate states of the world:

- (a) The “actual world,” in which products containing DXM are available OTC; and
- (b) A hypothetical counter-factual scenario (“but-for world” or “BFW”), where products containing DXM are only available with a prescription. This scenario is similar to the current market availability of low-dose codeine cough products. Since codeine is scheduled as a controlled substance, these cough products are available by prescription or from behind-the-counter.

This paper implements a cost-minimization analysis to estimate the cost savings resulting from the OTC availability of products with DXM. Information on the cough suppressant market segment (where DXM plays the most significant role) is provided by IRI Infoscan, a company that uses a national scanner-based tracking system and digests weekly reports from scanner facilities in thousands of grocery stores, drug stores, and department stores.<sup>45</sup> The stakeholders included are patients, employers, and payors (e.g., health insurers and managed care organizations).<sup>46</sup>

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<sup>45</sup> John Labate, “Companies to Watch,” *Fortune Magazine*, December 27, 1993, [http://archive.fortune.com/magazines/fortune/fortune\\_archive/1993/12/27/78787/index.htm](http://archive.fortune.com/magazines/fortune/fortune_archive/1993/12/27/78787/index.htm).

<sup>46</sup> There might be additional effects on the physicians, pharmacists, and drug manufacturers not included in the model. On the one hand, pharmacies may benefit by way of the dispensing fees in the Rx context, but they may also lose revenue from foot traffic and concurrent purchases in the event that some DXM sales get lost during the OTC-to-Rx switch. Quantifying the effect on pharmacies requires consideration of demand and price sensitivities. Physicians may benefit from the additional visits and revenue in the Rx context, but may also realize higher costs, potentially including drug-seeking behavior by new patients. The effects on manufacturers would depend on volume or profit changes prompted by the regulatory change. In the absence of additional information on upstream costs to anticipate whether margins would change, this analysis drops manufacturers from consideration. Similarly, an OTC-to-Rx conversion would likely subject products with DXM to the cost- and access-control mechanisms typically employed by payors (e.g., formularies, preferred drug lists, prior authorization, quantity limits). These measures could directly affect volume and indirectly affect profitability through rebate requirements. The model does not account for such dynamic effects.

## Model

This paper looks at how much Rx-only access to DXM products would cost patients, employers, and payors<sup>47</sup> over a 10-year window (beginning in 2016 and continuing until 2025), in comparison to a scenario in which the products remain available OTC. The forecasts are built using the most recent data available for drug costs, physician costs, diversion to alternative medicine, work absenteeism, work presenteeism, and patient travel costs. The analysis considers several channels for differentiating the two regimes. In what follows, we break out each of these channels:

### Direct costs

- (a) **Drug costs.** In the OTC context, patients are assumed to bear all DXM drug costs. However, in the Rx world, patients and payors split the drug costs.<sup>48</sup> For the purposes of this study, total drug price is calculated as the product of the “but-for world” average DXM Rx price and the number of hypothetical DXM prescriptions.

A key question for this analysis is whether patients who had purchased OTC products would still purchase those products if they were only available with a physician’s prescription. Based on economic theory and evidence from the literature, it is expected that demand would decrease as a result of the higher prices and limited availability accompanying Rx access. Some patients would likely choose to buy non-DXM OTC alternatives, some would likely receive an alternative Rx suggestion from their physicians, and others would likely give up on cough medication entirely.

To account for the expected decline in demand, the number of OTC DXM packages purchased is converted into a potential prescription count in the Rx context. In this conversion, each potential prescription is assumed to correspond to one OTC package, as informed by the pseudoephedrine (“PSE”) experience, in which another product

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<sup>47</sup> “Payors” refers to both public and private health insurers and pharmacy benefits managers. Examples of private insurers include Blue Cross Blue Shield, Cigna, Humana, Aetna, and others. Public payors refers to Medicare, Medicaid, and other government-funded programs. Pharmacy benefits managers are third party administrators of prescription drug programs like Express Scripts or Caremark Rx. Our analysis focuses on the effect on private and public health insurers.

<sup>48</sup> As a result, payors/employers pay more but the patient probably pays less (as long as copay is less than the OTC cost of the therapy and as long as the payor provides at least partial coverage of the drug).

ingredient formerly available OTC was converted to Rx-only in two states.<sup>49 50</sup> The resulting potential Rx count is then adjusted to reflect the drop in demand resulting from higher prices and restricted access relative to OTC. This analysis considers two values (17 and 25%) to characterize the retention of DXM sales following an OTC-to-Rx switch, again based on the PSE experience. Conversion of PSE from OTC to Rx-only resulted in an 83% decrease in utilization and a 75% drop in sales, leaving 17% and 25%, respectively, in residual demand.<sup>51</sup> Therefore, the BFW number of DXM prescriptions is estimated as 17 or 25% of the actual number of DXM OTC cough packages.

To determine the expected costs of Rx purchases of DXM, the expected number of prescriptions needs to be multiplied by the expected price per prescription. Based on the PSE experience, DXM's average Rx price is assumed to be 35% higher than the average DXM OTC price.<sup>52</sup> An inflation rate of 2.6% is applied annually using the 2015 seasonally adjusted annual Consumer Price Index of medical care by all urban consumers.<sup>53</sup>

- (b) **Physician costs.** This is the total amount paid by patients and payors for the time spent with a physician, estimated as the product of the average physician cost per visit and the number of hypothetical new physician visits in the BFW. The average physician cost is an average of costs by payor type, weighted by the population share by payor type, from the Kaiser Family Foundation.<sup>54</sup> The number of new physician visits is obtained by assuming that one-third of the BFW DXM prescriptions described above will actually require a physician visit. It is assumed that the other two-thirds of patients would be able

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<sup>49</sup> PSE is an active ingredient in many decongestants and is intended to relieve cold and allergy symptoms. Due to concerns about its diversion to make illicit methamphetamine, national and state regulators have limited access to PSE by making it a behind-the-counter drug or, in two states, prescription-only. See Richard Chapman et al., "Managing Access to Pseudoephedrine / Potential Impacts of a Prescription-Only Policy versus Real-Time Stop Sale Technology," Avalere Health LLC, April 2014 ("Avalere 2014"), p. 2.

<sup>50</sup> Therefore, 100 bottles sold in the OTC context translates to 100 potential prescriptions in the BFW. See Avalere 2014 at p. 44.

<sup>51</sup> This would imply that 17% and 25% of utilization and sales respectively would be maintained. See Avalere 2014 at pp. 24, 47.

<sup>52</sup> See Avalere 2014 at p. 34.

<sup>53</sup> "Consumer Price Index - All Urban Consumers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CUUR0000SAM?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths).

<sup>54</sup> See Avalere 2014 at pp. 33–37; "Health Insurance Coverage of the Total Population," Kaiser Family Foundation, 2014, <http://kff.org/other/state-indicator/total-population>.

to obtain a prescription by calling or faxing their physicians, thus avoiding the actual visit.<sup>55</sup>

#### Indirect costs

- (a) **Diversion to alternative medicine.** Some patients who currently use OTC products that contain DXM may pursue a different cough therapy if DXM were no longer available OTC. These patients could obtain non-DXM products, some of which might be more expensive. Some current OTC DXM patients might switch to other upper-respiratory OTC drugs, and others would switch to Rx medicine. Finally, some price-sensitive patients may choose not to purchase any medication at all. In the absence of prior information, two alternative scenarios have been explored with respect to patients who no longer purchase DXM.<sup>56</sup>
- (b) **Work absenteeism.** Workers who need to visit a physician during regular business hours, whether for themselves or assisting a family member, are often required to use sick or personal time. Sick time may cost employers in two ways:
- (1) Wage expenses; and
  - (2) Opportunity costs due to lost revenue, co-workers' overtime, overstaffing strategies, and temporary replacement.<sup>57</sup>

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<sup>55</sup> See Avalere 2014 at pp. 29, 47.

<sup>56</sup> When considering the diversion of DXM sales to alternative Rx medication, we look at what the drug costs would be if consumers switched to Rx codeine. There is some evidence that if consumers did not have access to OTC DXM, a portion of the population would likely go to a healthcare provider to obtain a prescription for codeine or benzonatate-containing cough medicines. See CHPA 2010 at p. 3. DXM medicine is on average cheaper than non-DXM OTC medicine. As shown in **Exhibit A**, the average DXM purchase price for 2014 – 2015 is \$7.88 per package while the average non-DXM OTC medicine purchase cost is \$8.57. The average purchase price for codeine is derived as \$23.77 per package (see **Technical Appendix B**). An argument can be made that those patients who would not purchase cough medication in the BFW, would lose consumer surplus from the lost benefit of being able to alleviate their physical discomfort. Under OTC access, their willingness to pay for DXM exceeds the cost of the drug. Under a hypothetical Rx-only access, the BFW price exceeds their willingness to pay and there is some lost surplus. The present study does not account for this loss to some of the patients and is therefore conservative.

<sup>57</sup> "What's at Risk in Maintaining the Status Quo?" Integrated Benefits Institute, July 2011, [https://ibiweb.org/?ACT=65&id=UT\\_iJZ4zbUzGxtvCOjYckGR3KnCEQPQrOiwX2mdozAaXZJHTWLuNB6dWcUoIv5v4D7tdb8QPmjiYlqH6PpTHcg](https://ibiweb.org/?ACT=65&id=UT_iJZ4zbUzGxtvCOjYckGR3KnCEQPQrOiwX2mdozAaXZJHTWLuNB6dWcUoIv5v4D7tdb8QPmjiYlqH6PpTHcg).

Due to OTC availability, workers do not need to take sick time in order to visit a physician office and as a result generate relative cost savings to the employers.<sup>58</sup> Since employees continue to receive wages while on sick time, only the indirect costs to the employers in (2) above are considered as losses.

Work absenteeism costs resulting from the OTC-to-Rx switch of DXM are obtained as the product of the indirect costs to the employers, the average number of hours per physician visit, and the number of new physician visits described above. The average time per physician visit has been estimated as 121 minutes.<sup>59</sup> The indirect costs to the employers are informed by a number of studies suggesting that productivity losses from sick time are higher than the average wages of the workers due to difficulties with replaceability, time-sensitivity, and inter-related teamwork. A 2013 study quantifies the indirect impact of work absences for the entire U.S. workforce (weighted for workers in different industries) as 38% above average wages.<sup>60</sup> Similarly, a 2006 study estimates indirect costs as 44% above wages.<sup>61</sup> Accordingly, the indirect costs to the employers are estimated as 38% of the average hourly wage for the U.S.

### Additional considerations

- (a) **Work presenteeism.** Work presenteeism is an alternative phenomenon observed when employees go to work while sick. This can lead to less productivity, more sick people, more sick time off, and more medical expenses for employees, payors, and state governments. Several studies have quantified the amount of lost work productivity on the job due to colds. Estimates range from 5.9 to 15 hours per cold episode.<sup>62</sup> If the switch to Rx access discourages some portion of the population from purchasing any

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<sup>58</sup> Several studies have demonstrated decreased productivity loss from sick time due to the availability of OTC medicines ("The Case for Self-Care and Over-The-Counter Medicines: Value-Add to Health Care and Productivity for Employees and Employers," Institute for Health and Productivity Management, 2015, [https://www.ihpm.org/pdf/IHPM\\_self-care\\_lores.pdf](https://www.ihpm.org/pdf/IHPM_self-care_lores.pdf); "Over-The-Counter Drugs Could Save \$4.75 Billion Annually," Northwestern, November 1, 2004, <http://www.northwestern.edu/newscenter/stories/2004/11/upper.html>; Patrick W. Sullivan and Michael B. Nichol, "The Economic Impact of Payer Policies after the Rx-to-OTC Switch of Second-Generation Antihistamines," *Value in Health*, 7, July 2004, <http://onlinelibrary.wiley.com/enhanced/doi/10.1111/j.1524-4733.2004.74003.x>).

<sup>59</sup> Out of these 121 minutes, 37 minutes were spent in travel and 84 minutes were clinic time. See Kristin Ray et al., "Opportunity Costs of Ambulatory Medical Care in the United States," *American Journal of Managed Care*, 21 (8), 2015, pp. 567-574.

<sup>60</sup> Brian Gifford, "The Cost of an Absence: IBI's Lost Productivity Method," Integrated Benefits Institute, 2013, pp. 4-8.

<sup>61</sup> Sean Nicholson et al., "Measuring the effects of work loss on productivity with team production," *Health Economics*, 15 (2), February 2006.

<sup>62</sup> See Bramley et al. 2002 at pp. 822–829; J. Hellgren et al., "Allergic rhinitis and the common cold – high cost to society," *Allergy*, 2010, pp. 776–783.

cough medicine, it could result into a higher incidence of people with cold symptoms. This study excludes presenteeism costs from the analysis of cost saving due to difficulties with quantifying the incremental number of new cold episodes that would result from making DXM prescription-only.

- (b) **Patient travel costs.** The impact on travel costs is assumed to be negligible, as most people have easy access to a local pharmacy, drug store, or supermarket. Alternatively, they could still shop for other items to assist in their comfort (e.g., tissues or tea). In the BFW, some patients must spend time and money to travel to a physician's office,<sup>63</sup> resulting in transportation costs for gas or public transit.<sup>64</sup> As described above, this analysis accounts for the employer cost when an employee travels to the doctor's office.<sup>65</sup> The present study is conservative in that it does not account for the transportation costs to the employee (e.g., personal vehicle or public transportation costs).

## Results

**Exhibit B** reports the 10-year cost-savings estimates from over-the-counter availability of DXM. If DXM continues to be available OTC, the estimate for DXM drug expenditures for 2016 – 2025 is \$21.1 billion. Based on assumptions from an analogous natural experiment, prescription-only access is estimated to generate additional costs in the range of \$22 billion and \$31 billion for the period 2016 – 2025. Relaxing the price increase assumption and assuming alternatively that DXM average prices remained unchanged after the regime change yields DXM OTC cost savings between \$21 billion and \$29 billion.

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<sup>63</sup> See Avalere 2014 at p. 23.

<sup>64</sup> Contractual workers would also miss out on wages for the time they are visiting the physician.

<sup>65</sup> When an employee takes sick time to visit a physician, the employer loses money in the form of sick-time wages.

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**Exhibit A: Actual Sales and Average Prices of Upper Respiratory Over-the-Counter Products Drugs**

	52 Weeks Ending September 7, 2014	52 Weeks Ending July 12, 2015	52-week Average
	[a]	[b]	[c]
<i>Unit Sales (million packages)</i>			
[1] Non- DXM	22	25	24
[2] DXM	236	234	235
[3] <b>Total</b>	258	259	259
[4] DXM Unit Share	91%	90%	91%
<i>Dollar Sales (\$ millions)</i>			
[5] Non-DXM	177	233	205
[6] DXM	1,805	1,897	1,851
[7] <b>Total</b>	1,982	2,130	2,056
[8] DXM Dollar Share	91%	89%	90%
<i>Average Price (\$/package)</i>			
[9] Non-DXM Average Price	7.96	9.18	8.57
[10] DXM Average Price	7.66	8.10	7.88

**Notes and Source:**

[1]-[2] Information Resources, Inc. ("IRI") Infoscan.

[3] = [1] + [2].

[4] = [2] / [3].

[5]-[6] Information Resources, Inc. ("IRI") Infoscan.

[7] = [5] + [6].

[8] = [6] / [7].

[9] = [5] / [1].

[10] = [6] / [2].

[c] = average of [a] & [b].

**Exhibit B : DXM Cost-Savings Forecasts Summary (2016-2025)**

	<b>Prescription Cost Forecasts</b>	<b>Cost Savings</b>
	<b>(\$ millions)</b>	<b>(\$ millions)</b>
	[a]	[b]
<i>35% DXM Price Increase</i>		
[1] 25% Retention, 1/3 - 1/3 - 1/3 Diverted Sales	52,063	30,991
[2] 17% Retention, 1/3 - 1/3 - 1/3 Diverted Sales	44,523	23,452
[3] 25% Retention, 1/2 - 1/4 - 1/4 Diverted Sales	50,967	29,895
[4] 17% Retention, 1/2 - 1/4 - 1/4 Diverted Sales	43,311	22,239
<i>No DXM Price Increase</i>		
[5] 25% Retention, 1/3 - 1/3 - 1/3 Diverted Sales	50,240	29,168
[6] 17% Retention, 1/3 - 1/3 - 1/3 Diverted Sales	43,284	22,212
[7] 25% Retention, 1/2 - 1/4 - 1/4 Diverted Sales	49,144	28,072
[8] 17% Retention, 1/2 - 1/4 - 1/4 Diverted Sales	42,071	21,000

**Notes & Sources:**

The cost from OTC access for 2016-2025 is estimated at \$21,072 million. See Appendix C-1.

- [1] Appendix C-2(a).
- [2] Appendix C-2(b).
- [3] Appendix C-2(c).
- [4] Appendix C-2(d).
- [5] Appendix C-2(e).
- [6] Appendix C-2(f).
- [7] Appendix C-2(g).
- [8] Appendix C-2(h).
- [b] = [a] - 21,072.

**Appendix A: Actual Sales and Average Prices of Upper Respiratory Over-the-Counter Products Drugs**

	52 Weeks Ending September 7, 2014	52 Weeks Ending July 12, 2015	52-week Average
	[a]	[b]	[c]
<i>Unit Sales (million packages)</i>			
[1] Non- DXM	22	25	24
[2] DXM	236	234	235
[3] <b>Total</b>	258	259	259
[4] DXM Unit Share	91%	90%	91%
<i>Dollar Sales (\$ millions)</i>			
[5] Non-DXM	177	233	205
[6] DXM	1,805	1,897	1,851
[7] <b>Total</b>	1,982	2,130	2,056
[8] DXM Dollar Share	91%	89%	90%
<i>Average Price (\$/package)</i>			
[9] Non-DXM Average Price	7.96	9.18	8.57
[10] DXM Average Price	7.66	8.10	7.88

**Notes and Source:**

- [1]-[2] Information Resources, Inc. ("IRI") Infoscan.  
 [3] = [1] + [2].  
 [4] = [2] / [3].  
 [5]-[6] Information Resources, Inc. ("IRI") Infoscan.  
 [7] = [5] + [6].  
 [8] = [6] / [7].  
 [9] = [5] / [1].  
 [10] = [6] / [2].  
 [c] = average of [a] & [b].

## Appendix B : Derivation of an Average Codeine Package Price

[1]	DXM Actual Average Purchase Price (\$/package)	7.88
	<i>Price per MG</i>	
[2]	DXM Average List Price Per Milligram (\$/mg)	0.02
[3]	Codeine Average List Price Per Milligram (\$/mg)	0.08
[4]	Price Ratio (Codeine / DXM)	4.02
	<i>Relative Dosage</i>	
[5]	DXM Strength Per Average Recommended Dosage (mg)	20
[6]	Codeine Strength Per Average Recommended Dosage (mg)	15
[7]	Efficacy Ratio (Codeine / DXM)	0.75
[8]	Efficacy-adjusted Price Ratio	3.02
[9]	<u>Derived Codeine Average Purchase Price (\$/package)</u>	<u>23.77</u>

### Notes and Sources:

- [1] Exhibit A.
- [2] - [3] List prices for DXM and codeine were obtained in March 2016 from Truven Health Analytics' Red Book, a drug pricing resource. Codeine prices are for products with cough and cold indications and excludes codeine products with pain relief indications. Price per MG was derived by dividing the package price reported in the Red Book by the amount of DXM in MG derived from the strength and package size information.
- [4] = [3] / [2].
- [5] The DXM recommended adult dosage range is 10mg - 30mg. The average of this range (20) is used to proxy for DXM's average dose. See "Dextromethorphan Dosage," <http://www.drugs.com/dosage/dextromethorphan.html>.
- [6] The codeine recommended adult dosage range is 10mg - 20mg. The average of this range (15) and used to proxy for codeine's average dose. See "Codeine," <http://www.drugs.com/monograph/codeine.html>.
- [7] = [6] / [5].
- [8] = [3] \* [5].
- [9] = [1] \* [8].

### Appendix C : DXM Cost-Savings Forecasts Summary (2016-2025)

	Prescription Cost Forecasts	Cost Savings
	(\$ millions)	(\$ millions)
	[a]	[b]
<i>35% DXM Price Increase</i>		
[1] 25% Retention, 1/3 - 1/3 - 1/3 Diverted Sales	52,063	30,991
[2] 17% Retention, 1/3 - 1/3 - 1/3 Diverted Sales	44,523	23,452
[3] 25% Retention, 1/2 - 1/4 - 1/4 Diverted Sales	50,967	29,895
[4] 17% Retention, 1/2 - 1/4 - 1/4 Diverted Sales	43,311	22,239
<i>No DXM Price Increase</i>		
[5] 25% Retention, 1/3 - 1/3 - 1/3 Diverted Sales	50,240	29,168
[6] 17% Retention, 1/3 - 1/3 - 1/3 Diverted Sales	43,284	22,212
[7] 25% Retention, 1/2 - 1/4 - 1/4 Diverted Sales	49,144	28,072
[8] 17% Retention, 1/2 - 1/4 - 1/4 Diverted Sales	42,071	21,000

#### Notes & Sources:

The cost from OTC access for 2016-2025 is estimated at \$21,072 million. See Appendix C-1.

- [1] Appendix C-2(a).
- [2] Appendix C-2(b).
- [3] Appendix C-2(c).
- [4] Appendix C-2(d).
- [5] Appendix C-2(e).
- [6] Appendix C-2(f).
- [7] Appendix C-2(g).
- [8] Appendix C-2(h).
- [b] = [a] - 21,072.

**Appendix C-1: DXM Over-the-Counter Cost Forecasts**

	[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]	[i]	[j]	[k]	
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	
<i>Drug Expenditures</i>												
[1]	Average Price (\$)	7.97	8.18	8.39	8.61	8.83	9.06	9.30	9.54	9.79	10.04	
[2]	Unit Sales (millions)	235	235	235	235	235	235	235	235	235	235	
[3]	<b>Total (\$ millions)</b>	<b>1,872</b>	<b>1,921</b>	<b>1,971</b>	<b>2,022</b>	<b>2,075</b>	<b>2,129</b>	<b>2,184</b>	<b>2,241</b>	<b>2,299</b>	<b>2,359</b>	<b>21,072</b>

**Notes and Sources:**

- [1][a]-[j] 52-week average from Exhibit A \* compounded inflation rate of 2.6%. The 2.6% inflation rate is derived from the 2015 annual average Consumer Price Index of medical care by all urban consumers ("Consumer Price Index - All Urban Consumers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CUUR0000SAM?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths)).
- [2][a]-[j] 52-week average from Exhibit A.
- [3] = [1] \* [2].
- [k] Sum of [3][a]-[k].

**Appendix C-2(a): DXM Prescription Cost Forecasts (35% DXM Price Increase, 25% Retention, 1/3 - 1/3 - 1/3 Diverted Sales)**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	
<i>Number of New Prescriptions and Physician Visits</i>												
[1]	Potential number of new DXM Rx (millions)	235	235	235	235	235	235	235	235	235		
[2]	Retention rate	25%	25%	25%	25%	25%	25%	25%	25%	25%		
[3]	<b>New DXM prescriptions (millions)</b>	59	59	59	59	59	59	59	59	59	587	
[4]	<b>Number of new physician visits (millions)</b>	20	20	20	20	20	20	20	20	20	196	
<i>Physician Costs</i>												
Average physician cost per visit by payor type (\$)												
[5]	Public	73	75	77	79	81	83	85	87	89	92	
[6]	Private	112	112	112	113	113	113	113	114	114	114	
[7]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Population coverage not accounting for uninsured patients												
[8]	Public	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[9]	Private	62%	62%	62%	62%	62%	62%	62%	62%	62%	62%	
[10]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
[11]	<b>Total Cost (\$ millions)</b>	1,899	1,916	1,933	1,951	1,969	1,987	2,006	2,025	2,045	2,065	19,797
<i>DXM Drug Expenditures</i>												
[12]	Actual average DXM drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[13]	DXM price increase due to regime switch	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	
[14]	Average DXM Rx drug price (\$/package)	10.64	10.92	11.20	11.49	11.79	12.10	12.41	12.73	13.06	13.40	
[15]	<b>Total DXM drug expenditures following regime switch (\$ millions)</b>	625	641	658	675	692	710	729	748	767	787	7,031
<i>Work Absenteeism Costs (from new physician visits)</i>												
[16]	Total time diverted (hours)	2	2	2	2	2	2	2	2	2	2	
[17]	Average hourly wage (\$)	25.26	25.36	25.46	25.56	25.67	25.77	25.87	25.98	26.08	26.18	
[18]	Indirect costs	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[19]	Average hourly wage diverted (\$)	9.60	9.64	9.68	9.71	9.75	9.79	9.83	9.87	9.91	9.95	
[20]	<b>Total (\$ millions)</b>	379	380	382	383	385	387	388	390	391	393	3,858
<i>Diversion to Alternative Medication</i>												
[21]	Actual average drug price for other OTC drugs (\$/package)	8.57	8.79	9.02	9.26	9.50	9.75	10.00	10.26	10.53	10.80	
[22]	Average other Rx drug price (\$/package)	23.77	24.39	25.03	25.68	26.35	27.03	27.73	28.45	29.19	29.95	
[23]	Diverted DXM Rx sales (millions)	176	176	176	176	176	176	176	176	176	176	
[24]	DXM Rx diverted to other OTC drugs	59	59	59	59	59	59	59	59	59	59	
[25]	DXM Rx diverted to other Rx drugs	59	59	59	59	59	59	59	59	59	59	
[26]	Drug expenditures on other OTC drugs following regime switch (\$ millions)	503	516	530	544	558	572	587	602	618	634	
[27]	Drug expenditures on other Rx drugs following regime switch (\$ millions)	1,396	1,432	1,470	1,508	1,547	1,587	1,628	1,671	1,714	1,759	
[28]	<b>Total non-DXM drug expenditures following regime switch (\$ millions)</b>	1,899	1,949	1,999	2,051	2,105	2,159	2,216	2,273	2,332	2,393	21,377
[29]	<b>Total Cost (\$ millions)</b>	<b>4,802</b>	<b>4,886</b>	<b>4,972</b>	<b>5,060</b>	<b>5,151</b>	<b>5,243</b>	<b>5,338</b>	<b>5,436</b>	<b>5,536</b>	<b>5,638</b>	<b>52,063</b>

## Appendix C-2(a): DXM Prescription Cost Forecasts (35% DXM Price Increase, 25% Retention, 1/3 - 1/3 - 1/3 Diverted Sales)

### Notes & Sources:

- [1] Exhibit A. It is assumed that every package of DXM actually sold OTC will translate into one Rx in the but-for world.
- [2] In this scenario, it is assumed that retention rate will be 25%.
- [3] = [1] \* [2].
- [4] = [1] \* [2] \* (1/3). It is assumed that 1/3 of the new DXM prescriptions will require a new physician visit.
- [5]-[7] Average physician cost for 2016 is from Appendix D. A compounded inflation rate of 2.6% after 2016 is applied. The 2.6% inflation rate is derived from the 2015 annual Consumer Price Index of medical care by all urban consumers. "Consumer Price Index - All Urban Consumers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CUUR0000SAM?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths).
- [8]-[10] Appendix E.
- [11] = [4] \* [5] \* [8] + [4] \* [6] \* [9]. Total physician cost weighted by payor type, based on number of new physician visits.
- [12] Exhibit A. The average DXM price is compounded at 2.6% after 2016.
- [13] The 35% price increase is borrowed from the Avalere Report, p. 26.
- [14] = [12] \* (1 + [13]).
- [15] = [3] \* [14].
- [16] 121 minutes. Ray, Kristin et al., "Opportunity Costs of Ambulatory Medical Care in the United States," American Journal of Managed Care, 21 (8), 2015 ("Ray et al. 2015"), pp. 567-574
- [17] The 2016 wage is set at the December 2015 U.S. average hourly wage from the Bureau of Labor Statistics, <http://www.bls.gov/news.release/empsit.t19.htm>. The wage is compounded at 0.4% after 2016. The 0.4% inflation rate is derived from the 2015 annual Consumer Price Index of all urban wage earners and clerical workers. "Consumer Price Index - Urban Wage Earners and Clerical Workers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CWUR0000SA0?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CWUR0000SA0?output_view=pct_12mths).
- [18] Indirect costs dues to work absenteeism are assumed to be 38% of average wages following Gifford, Brian, "The Cost of an Absence: IBI's Diverted Productivity Method," Integrated Benefits Institute, 2013, pp. 4-8.
- [19] = [17] \* [18].
- [20] = [4] \* [16] \* [19].
- [21] Exhibit A. The average package price for non-DXM OTC drugs is compounded at 2.6% after 2016.
- [22] Appendix B . The average package price for Rx drugs is compounded at 2.6% after 2016.
- [23] = [1] \* (1-[2]).
- [24]-[25] = [23] \* (1/3). It is assumed that the diverted DXM Rx sales are spilt equally three ways between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [26] = [21] \* [24].
- [27] = [22] \* [25].
- [28] = [26] + [27].
- [29] = [11] + [15] + [20] + [28].



**Appendix C-2(b): DXM Prescription Cost Forecasts (35% DXM Price Increase, 17% Retention, 1/3 - 1/3 - 1/3 Diverted Sales)**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	
<i>Number of New Prescriptions and Physician Visits</i>												
[1]	Potential number of new DXM Rx (millions)	235	235	235	235	235	235	235	235	235		
[2]	Retention rate	17%	17%	17%	17%	17%	17%	17%	17%	17%		
[3]	<b>New DXM prescriptions (millions)</b>	40	40	40	40	40	40	40	40	40	399	
[4]	<b>Number of new physician visits (millions)</b>	13	13	13	13	13	13	13	13	13	133	
<i>Physician Costs</i>												
Average physician cost per visit by payor type (\$)												
[5]	Public	73	75	77	79	81	83	85	87	89	92	
[6]	Private	112	112	112	113	113	113	113	114	114	114	
[7]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Population coverage not accounting for uninsured patients												
[8]	Public	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[9]	Private	62%	62%	62%	62%	62%	62%	62%	62%	62%	62%	
[10]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
[11]	<b>Total Cost (\$ millions)</b>	1,291	1,303	1,315	1,327	1,339	1,351	1,364	1,377	1,391	1,404	13,462
<i>DXM Drug Expenditures</i>												
[12]	Actual average DXM drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[13]	DXM price increase due to regime switch	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	
[14]	Average DXM Rx drug price (\$/package)	10.64	10.92	11.20	11.49	11.79	12.10	12.41	12.73	13.06	13.40	
[15]	<b>Total DXM drug expenditures following regime switch (\$ millions)</b>	425	436	447	459	471	483	496	508	522	535	4,781
<i>Work Absenteeism Costs (from new physician visits)</i>												
[16]	Total time diverted (hours)	2	2	2	2	2	2	2	2	2	2	
[17]	Average hourly wage (\$)	25.26	25.36	25.46	25.56	25.67	25.77	25.87	25.98	26.08	26.18	
[18]	Indirect costs	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[19]	Average hourly wage diverted (\$)	9.60	9.64	9.68	9.71	9.75	9.79	9.83	9.87	9.91	9.95	
[20]	<b>Total (\$ millions)</b>	258	259	260	261	262	263	264	265	266	267	2,623
<i>Diversion to Alternative Medication</i>												
[21]	Actual average drug price for other OTC drugs (\$/package)	8.57	8.79	9.02	9.26	9.50	9.75	10.00	10.26	10.53	10.80	
[22]	Average other Rx drug price (\$/package)	23.77	24.39	25.03	25.68	26.35	27.03	27.73	28.45	29.19	29.95	
[23]	Diverted DXM Rx sales (millions)	195	195	195	195	195	195	195	195	195	195	
[24]	DXM Rx diverted to other OTC drugs	65	65	65	65	65	65	65	65	65	65	
[25]	DXM Rx diverted to other Rx drugs	65	65	65	65	65	65	65	65	65	65	
[26]	Drug expenditures on other OTC drugs following regime switch (\$ millions)	557	571	586	602	617	633	650	667	684	702	
[27]	Drug expenditures on other Rx drugs following regime switch (\$ millions)	1,545	1,585	1,626	1,669	1,712	1,756	1,802	1,849	1,897	1,946	
[28]	<b>Total non-DXM drug expenditures following regime switch (\$ millions)</b>	2,102	2,157	2,213	2,270	2,329	2,390	2,452	2,516	2,581	2,648	23,657
[29]	<b>Total Cost (\$ millions)</b>	<b>4,076</b>	<b>4,154</b>	<b>4,234</b>	<b>4,316</b>	<b>4,401</b>	<b>4,487</b>	<b>4,575</b>	<b>4,666</b>	<b>4,759</b>	<b>4,855</b>	<b>44,523</b>

**Appendix C-2(b): DXM Prescription Cost Forecasts (35% DXM Price Increase, 17% Retention, 1/3 - 1/3 - 1/3 Diverted Sales)**

**Notes & Sources:**

- [1] Exhibit A. It is assumed that every package of DXM actually sold OTC will translate into one Rx in the but-for world.
- [2] In this scenario, it is assumed that retention rate will be 17%.
- [3] = [1] \* [2].
- [4] = [1] \* [2] \* (1/3). It is assumed that 1/3 of the new DXM prescriptions will require a new physician visit.
- [5]-[7] Average physician cost for 2016 is from Appendix D. A compounded inflation rate of 2.6% after 2016 is applied. The 2.6% inflation rate is derived from the 2015 annual Consumer Price Index of medical care by all urban consumers. "Consumer Price Index - All Urban Consumers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CUUR0000SAM?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths).
- [8]-[10] Appendix E.
- [11] = [4] \* [5] \* [8] + [4] \* [6] \* [9]. Total physician cost weighted by payor type, based on number of new physician visits.
- [12] Exhibit A. The average DXM price is compounded at 2.6% after 2016.
- [13] The 35% price increase is borrowed from the Avalere Report, p. 26.
- [14] = [12] \* (1 + [13]).
- [15] = [3] \* [14].
- [16] 121 minutes. Ray, Kristin et al., "Opportunity Costs of Ambulatory Medical Care in the United States," American Journal of Managed Care, 21 (8), 2015 ("Ray et al. 2015"), pp. 567-574
- [17] The 2016 wage is set at the December 2015 U.S. average hourly wage from the Bureau of Labor Statistics, <http://www.bls.gov/news.release/empsit.t19.htm>. The wage is compounded at 0.4% after 2016. The 0.4% inflation rate is derived from the 2015 annual Consumer Price Index of all urban wage earners and clerical workers. "Consumer Price Index - Urban Wage Earners and Clerical Workers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CWUR0000SA0?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CWUR0000SA0?output_view=pct_12mths).
- [18] Indirect costs dues to work absenteeism are assumed to be 38% of average wages following Gifford, Brian, "The Cost of an Absence: IBI's Diverted Productivity Method," Integrated Benefits Institute, 2013, pp. 4-8.
- [19] = [17] \* [18].
- [20] = [4] \* [16] \* [19].
- [21] Exhibit A. The average package price for non-DXM OTC drugs is compounded at 2.6% after 2016.
- [22] Appendix B . The average package price for Rx drugs is compounded at 2.6% after 2016.
- [23] = [1] \* (1-[2]).
- [24]-[25] = [23] \* (1/3). It is assumed that the diverted DXM Rx sales are spilt equally three ways between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [26] = [21] \* [24].
- [27] = [22] \* [25].
- [28] = [26] + [27].
- [29] = [11] + [15] + [20] + [28].

**Appendix C-2(c): DXM Prescription Cost Forecasts (35% DXM Price Increase, 25% Retention, 1/2 - 1/4 - 1/4 Diverted Sales)**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	
<i>Number of New Prescriptions and Physician Visits</i>												
[1]	Potential number of new DXM Rx (millions)	235	235	235	235	235	235	235	235	235		
[2]	Retention rate	25%	25%	25%	25%	25%	25%	25%	25%	25%		
[3]	<b>New DXM prescriptions (millions)</b>	59	59	59	59	59	59	59	59	59	587	
[4]	<b>Number of new physician visits (millions)</b>	20	20	20	20	20	20	20	20	20	196	
<i>Physician Costs</i>												
Average physician cost per visit by payor type (\$)												
[5]	Public	73	75	77	79	81	83	85	87	89	92	
[6]	Private	112	112	112	113	113	113	113	114	114	114	
[7]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Population coverage not accounting for uninsured patients												
[8]	Public	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[9]	Private	62%	62%	62%	62%	62%	62%	62%	62%	62%	62%	
[10]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
[11]	<b>Total Cost (\$ millions)</b>	1,899	1,916	1,933	1,951	1,969	1,987	2,006	2,025	2,045	2,065	19,797
<i>DXM Drug Expenditures</i>												
[12]	Actual average DXM drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[13]	DXM price increase due to regime switch	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	
[14]	Average DXM Rx drug price (\$/package)	10.64	10.92	11.20	11.49	11.79	12.10	12.41	12.73	13.06	13.40	
[15]	<b>Total DXM drug expenditures following regime switch (\$ millions)</b>	625	641	658	675	692	710	729	748	767	787	7,031
<i>Work Absenteeism Costs (from new physician visits)</i>												
[16]	Total time diverted (hours)	2	2	2	2	2	2	2	2	2	2	
[17]	Average hourly wage (\$)	25.26	25.36	25.46	25.56	25.67	25.77	25.87	25.98	26.08	26.18	
[18]	Indirect costs	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[19]	Average hourly wage diverted (\$)	9.60	9.64	9.68	9.71	9.75	9.79	9.83	9.87	9.91	9.95	
[20]	<b>Total (\$ millions)</b>	379	380	382	383	385	387	388	390	391	393	3,858
<i>Diversion to Alternative Medication</i>												
[21]	Actual average drug price for other OTC drugs (\$/package)	8.57	8.79	9.02	9.26	9.50	9.75	10.00	10.26	10.53	10.80	
[22]	Average other Rx drug price (\$/package)	23.77	24.39	25.03	25.68	26.35	27.03	27.73	28.45	29.19	29.95	
[23]	Diverted DXM Rx sales (millions)	176	176	176	176	176	176	176	176	176	176	
[24]	DXM Rx diverted to other OTC drugs	88	88	88	88	88	88	88	88	88	88	
[25]	DXM Rx diverted to other Rx drugs	44	44	44	44	44	44	44	44	44	44	
[26]	Drug expenditures on other OTC drugs following regime switch (\$ millions)	755	775	795	815	837	858	881	904	927	951	
[27]	Drug expenditures on other Rx drugs following regime switch (\$ millions)	1,047	1,074	1,102	1,131	1,160	1,190	1,221	1,253	1,286	1,319	
[28]	<b>Total non-DXM drug expenditures following regime switch (\$ millions)</b>	1,802	1,849	1,897	1,946	1,997	2,049	2,102	2,157	2,213	2,270	20,281
[29]	<b>Total Cost (\$ millions)</b>	<b>4,705</b>	<b>4,786</b>	<b>4,870</b>	<b>4,955</b>	<b>5,043</b>	<b>5,133</b>	<b>5,225</b>	<b>5,319</b>	<b>5,416</b>	<b>5,515</b>	<b>50,967</b>

**Appendix C-2(c): DXM Prescription Cost Forecasts (35% DXM Price Increase, 25% Retention, 1/2 - 1/4 - 1/4 Diverted Sales)**

**Notes & Sources:**

- [1] Exhibit A. It is assumed that every package of DXM actually sold OTC will translate into one Rx in the but-for world.
- [2] In this scenario, it is assumed that retention rate will be 25%.
- [3] = [1] \* [2].
- [4] = [1] \* [2] \* (1/3). It is assumed that 1/3 of the new DXM prescriptions will require a new physician visit.
- [5]-[7] Average physician cost for 2016 is from Appendix D. A compounded inflation rate of 2.6% after 2016 is applied. The 2.6% inflation rate is derived from the 2015 annual Consumer Price Index of medical care by all urban consumers. "Consumer Price Index - All Urban Consumers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CUUR0000SAM?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths).
- [8]-[10] Appendix E.
- [11] = [4] \* [5] \* [8] + [4] \* [6] \* [9]. Total physician cost weighted by payor type, based on number of new physician visits.
- [12] Exhibit A. The average DXM price is compounded at 2.6% after 2016.
- [13] The 35% price increase is borrowed from the Avalere Report, p. 26.
- [14] = [12] \* (1 + [13]).
- [15] = [3] \* [14].
- [16] 121 minutes. Ray, Kristin et al., "Opportunity Costs of Ambulatory Medical Care in the United States," American Journal of Managed Care, 21 (8), 2015 ("Ray et al. 2015"), pp. 567-574
- [17] The 2016 wage is set at the December 2015 U.S. average hourly wage from the Bureau of Labor Statistics, <http://www.bls.gov/news.release/empsit.t19.htm>. The wage is compounded at 0.4% after 2016. The 0.4% inflation rate is derived from the 2015 annual Consumer Price Index of all urban wage earners and clerical workers. "Consumer Price Index - Urban Wage Earners and Clerical Workers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CWUR0000SA0?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CWUR0000SA0?output_view=pct_12mths).
- [18] Indirect costs dues to work absenteeism are assumed to be 38% of average wages following Gifford, Brian, "The Cost of an Absence: IBI's Diverted Productivity Method," Integrated Benefits Institute, 2013, pp. 4-8.
- [19] = [17] \* [18].
- [20] = [4] \* [16] \* [19].
- [22] Exhibit A. The average package price for non-DXM OTC drugs is compounded at 2.6% after 2016.
- [21] Exhibit A. The average package price for non-DXM OTC drugs is compounded at 2.6% after 2016.
- [22] Appendix B . The average package price for Rx drugs is compounded at 2.6% after 2016.
- [23] = [1] \* (1-[2]).
- [24]-[25] = [23] \* (1/3). It is assumed that the diverted DXM Rx sales are spilt equally three ways between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [26] = [21] \* [24].
- [27] = [22] \* [25].
- [28] = [26] + [27].
- [29] = [11] + [15] + [20] + [28].

**Appendix C-2(d): DXM Prescription Cost Forecasts (35% DXM Price Increase, 17% Retention, 1/2 - 1/4 - 1/4 Diverted Sales)**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	
<i>Number of New Prescriptions and Physician Visits</i>												
[1]	Potential number of new DXM Rx (millions)	235	235	235	235	235	235	235	235	235		
[2]	Retention rate	17%	17%	17%	17%	17%	17%	17%	17%	17%		
[3]	<b>New DXM prescriptions (millions)</b>	40	40	40	40	40	40	40	40	40	399	
[4]	<b>Number of new physician visits (millions)</b>	13	13	13	13	13	13	13	13	13	133	
<i>Physician Costs</i>												
Average physician cost per visit by payor type (\$)												
[5]	Public	73	75	77	79	81	83	85	87	89	92	
[6]	Private	112	112	112	113	113	113	113	114	114	114	
[7]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Population coverage not accounting for uninsured patients												
[8]	Public	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[9]	Private	62%	62%	62%	62%	62%	62%	62%	62%	62%	62%	
[10]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
[11]	<b>Total Cost (\$ millions)</b>	1,291	1,303	1,315	1,327	1,339	1,351	1,364	1,377	1,391	1,404	13,462
<i>DXM Drug Expenditures</i>												
[12]	Actual average DXM drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[13]	DXM price increase due to regime switch	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	
[14]	Average DXM Rx drug price (\$/package)	10.64	10.92	11.20	11.49	11.79	12.10	12.41	12.73	13.06	13.40	
[15]	<b>Total DXM drug expenditures following regime switch (\$ millions)</b>	425	436	447	459	471	483	496	508	522	535	4,781
<i>Work Absenteeism Costs (from new physician visits)</i>												
[16]	Total time Diverted (hours)	2	2	2	2	2	2	2	2	2	2	
[17]	Average hourly wage (\$)	25.26	25.36	25.46	25.56	25.67	25.77	25.87	25.98	26.08	26.18	
[18]	Indirect costs	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[19]	Average hourly wage diverted (\$)	9.60	9.64	9.68	9.71	9.75	9.79	9.83	9.87	9.91	9.95	
[20]	<b>Total (\$ millions)</b>	258	259	260	261	262	263	264	265	266	267	2,623
<i>Diversion to Alternative Medication</i>												
[21]	Actual average drug price for other OTC drugs (\$/package)	8.57	8.79	9.02	9.26	9.50	9.75	10.00	10.26	10.53	10.80	
[22]	Average other Rx drug price (\$/package)	23.77	24.39	25.03	25.68	26.35	27.03	27.73	28.45	29.19	29.95	
[23]	Diverted DXM Rx sales (millions)	195	195	195	195	195	195	195	195	195	195	
[24]	DXM Rx diverted to other OTC drugs	97	97	97	97	97	97	97	97	97	97	
[25]	DXM Rx diverted to other Rx drugs	49	49	49	49	49	49	49	49	49	49	
[26]	Drug expenditures on other OTC drugs following regime switch (\$ millions)	836	857	880	902	926	950	975	1,000	1,026	1,053	
[27]	Drug expenditures on other Rx drugs following regime switch (\$ millions)	1,159	1,189	1,220	1,251	1,284	1,317	1,352	1,387	1,423	1,460	
[28]	<b>Total non-DXM drug expenditures following regime switch (\$ millions)</b>	1,994	2,046	2,099	2,154	2,210	2,267	2,326	2,387	2,449	2,512	22,444
[29]	<b>Total Cost (\$ millions)</b>	<b>3,968</b>	<b>4,043</b>	<b>4,121</b>	<b>4,200</b>	<b>4,281</b>	<b>4,364</b>	<b>4,450</b>	<b>4,537</b>	<b>4,627</b>	<b>4,719</b>	<b>43,311</b>

**Appendix C-2(d): DXM Prescription Cost Forecasts (35% DXM Price Increase, 17% Retention, 1/2 - 1/4 - 1/4 Diverted Sales)**

**Notes & Sources:**

- [1] Exhibit A. It is assumed that every package of DXM actually sold OTC will translate into one Rx in the but-for world.
- [2] In this scenario, it is assumed that retention rate will be 17%.
- [3] = [1] \* [2].
- [4] = [1] \* [2] \* (1/3). It is assumed that 1/3 of the new DXM prescriptions will require a new physician visit.
- [5]-[7] Average physician cost for 2016 is from Appendix D. A compounded inflation rate of 2.6% after 2016 is applied. The 2.6% inflation rate is derived from the 2015 annual Consumer Price Index of medical care by all urban consumers. "Consumer Price Index - All Urban Consumers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CUUR0000SAM?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths).
- [8]-[10] Appendix E.
- [11] = [4] \* [5] \* [8] + [4] \* [6] \* [9]. Total physician cost weighted by payor type, based on number of new physician visits.
- [12] Exhibit A. The average DXM price is compounded at 2.6% after 2016.
- [13] The 35% price increase is borrowed from the Avalere Report, p. 26.
- [14] = [12] \* (1 + [13]).
- [15] = [3] \* [14].
- [16] 121 minutes. Ray, Kristin et al., "Opportunity Costs of Ambulatory Medical Care in the United States," American Journal of Managed Care, 21 (8), 2015 ("Ray et al. 2015"), pp. 567-574
- [17] The 2016 wage is set at the December 2015 U.S. average hourly wage from the Bureau of Labor Statistics, <http://www.bls.gov/news.release/empsit.t19.htm>. The wage is compounded at 0.4% after 2016. The 0.4% inflation rate is derived from the 2015 annual Consumer Price Index of all urban wage earners and clerical workers. "Consumer Price Index - Urban Wage Earners and Clerical Workers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CWUR0000SA0?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CWUR0000SA0?output_view=pct_12mths).
- [18] Indirect costs dues to work absenteeism are assumed to be 38% of average wages following Gifford, Brian, "The Cost of an Absence: IBI's Diverted Productivity Method," Integrated Benefits Institute, 2013, pp. 4-8.
- [19] = [17] \* [18].
- [20] = [4] \* [16] \* [19].
- [21] Exhibit A. The average package price for non-DXM OTC drugs is compounded at 2.6% after 2016.
- [22] Appendix B . The average package price for Rx drugs is compounded at 2.6% after 2016.
- [23] = [1] \* (1-[2]).
- [24] = [24] \* (1/2). It is assumed that the diverted DXM Rx sales are spilt three ways (1/2, 1/4, 1/4) between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [25] = [24] \* (1/4). It is assumed that the diverted DXM Rx sales are spilt three ways (1/2, 1/4, 1/4) between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [26] = [21] \* [24].
- [27] = [22] \* [25].
- [28] = [27] + [28].
- [29] = [11] + [15] + [20] + [28].

**Appendix C-2(e): DXM Prescription Cost Forecasts (No DXM Price Increase, 25% Retention, 1/3 - 1/3 - 1/3 Diverted Sales)**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	
<i>Number of New Prescriptions and Physician Visits</i>												
[1]	Potential number of new DXM Rx (millions)	235	235	235	235	235	235	235	235	235		
[2]	Retention rate	25%	25%	25%	25%	25%	25%	25%	25%	25%		
[3]	<b>New DXM prescriptions (millions)</b>	59	59	59	59	59	59	59	59	59	587	
[4]	<b>Number of new physician visits (millions)</b>	20	20	20	20	20	20	20	20	20	196	
<i>Physician Costs</i>												
Average physician cost per visit by payor type (\$)												
[5]	Public	73	75	77	79	81	83	85	87	89	92	
[6]	Private	112	112	112	113	113	113	113	114	114	114	
[7]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Population coverage not accounting for uninsured patients												
[8]	Public	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[9]	Private	62%	62%	62%	62%	62%	62%	62%	62%	62%	62%	
[10]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
[11]	<b>Total Cost (\$ millions)</b>	1,899	1,916	1,933	1,951	1,969	1,987	2,006	2,025	2,045	2,065	19,797
<i>DXM Drug Expenditures</i>												
[12]	Actual average DXM drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[13]	DXM price increase due to regime switch	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
[14]	Average DXM Rx drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[15]	<b>Total DXM drug expenditures following regime switch (\$ millions)</b>	463	475	487	500	513	526	540	554	568	583	5,208
<i>Work Absenteeism Costs (from new physician visits)</i>												
[16]	Total time diverted (hours)	2	2	2	2	2	2	2	2	2	2	
[17]	Average hourly wage (\$)	25.26	25.36	25.46	25.56	25.67	25.77	25.87	25.98	26.08	26.18	
[18]	Indirect costs	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[19]	Average hourly wage diverted (\$)	9.60	9.64	9.68	9.71	9.75	9.79	9.83	9.87	9.91	9.95	
[20]	<b>Total (\$ millions)</b>	379	380	382	383	385	387	388	390	391	393	3,858
<i>Diversion to Alternative Medication</i>												
[21]	Actual average drug price for other OTC drugs (\$/package)	8.57	8.79	9.02	9.26	9.50	9.75	10.00	10.26	10.53	10.80	
[22]	Average other Rx drug price (\$/package)	23.77	24.39	25.03	25.68	26.35	27.03	27.73	28.45	29.19	29.95	
[23]	Diverted DXM Rx sales (millions)	176	176	176	176	176	176	176	176	176	176	
[24]	DXM Rx diverted to other OTC drugs	59	59	59	59	59	59	59	59	59	59	
[25]	DXM Rx diverted to other Rx drugs	59	59	59	59	59	59	59	59	59	59	
[26]	Drug expenditures on other OTC drugs following regime switch (\$ millions)	503	516	530	544	558	572	587	602	618	634	
[27]	Drug expenditures on other Rx drugs following regime switch (\$ millions)	1,396	1,432	1,470	1,508	1,547	1,587	1,628	1,671	1,714	1,759	
[28]	<b>Total non-DXM drug expenditures following regime switch (\$ millions)</b>	1,899	1,949	1,999	2,051	2,105	2,159	2,216	2,273	2,332	2,393	21,377
[29]	<b>Total Cost (\$ millions)</b>	<b>4,640</b>	<b>4,720</b>	<b>4,802</b>	<b>4,885</b>	<b>4,971</b>	<b>5,059</b>	<b>5,150</b>	<b>5,242</b>	<b>5,337</b>	<b>5,434</b>	<b>50,240</b>

**Appendix C-2(e): DXM Prescription Cost Forecasts (No DXM Price Increase, 25% Retention, 1/3 - 1/3 - 1/3 Diverted Sales)**

**Notes & Sources:**

- [1] Exhibit A. It is assumed that every package of DXM actually sold OTC will translate into one Rx in the but-for world.
- [2] In this scenario, it is assumed that retention rate will be 25%.
- [3] = [1] \* [2].
- [4] = [1] \* [2] \* (1/3). It is assumed that 1/3 of the new DXM prescriptions will require a new physician visit.
- [5]-[7] Average physician cost for 2016 is from Appendix D. A compounded inflation rate of 2.6% after 2016 is applied. The 2.6% inflation rate is derived from the 2015 annual Consumer Price Index of medical care by all urban consumers. "Consumer Price Index - All Urban Consumers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CUUR0000SAM?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths).
- [8]-[10] Appendix E.
- [11] = [4] \* [5] \* [8] + [4] \* [6] \* [9]. Total physician cost weighted by payor type, based on number of new physician visits.
- [12] Exhibit A. The average DXM price is compounded at 2.6% after 2016.
- [13] It is assumed that there would be no price increase after the regime switch.
- [14] = [12] \* (1 + [13]).
- [15] = [3] \* [14].
- [16] 121 minutes. Ray, Kristin et al., "Opportunity Costs of Ambulatory Medical Care in the United States," American Journal of Managed Care, 21 (8), 2015 ("Ray et al. 2015"), pp. 567-574
- [17] The 2016 wage is set at the December 2015 U.S. average hourly wage from the Bureau of Labor Statistics, <http://www.bls.gov/news.release/empsit.t19.htm>. The wage is compounded at 0.4% after 2016. The 0.4% inflation rate is derived from the 2015 annual Consumer Price Index of all urban wage earners and clerical workers. "Consumer Price Index - Urban Wage Earners and Clerical Workers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CWUR0000SA0?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CWUR0000SA0?output_view=pct_12mths).
- [18] Indirect costs dues to work absenteeism are assumed to be 38% of average wages following Gifford, Brian, "The Cost of an Absence: IBI's Diverted Productivity Method," Integrated Benefits Institute, 2013, pp. 4-8.
- [19] = [17] \* [18].
- [20] = [4] \* [16] \* [19].
- [21] Exhibit A. The average package price for non-DXM OTC drugs is compounded at 2.6% after 2016.
- [22] Appendix B . The average package price for Rx drugs is compounded at 2.6% after 2016.
- [23] = [1] \* (1-[2]).
- [24]-[25] = [23] \* (1/3). It is assumed that the diverted DXM Rx sales are spilt equally three ways between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [26] = [21] \* [24].
- [27] = [22] \* [25].
- [28] = [26] + [27].
- [29] = [11] + [15] + [20] + [28].



**Appendix C-2(f): DXM Prescription Cost Forecasts (No DXM Price Increase, 17% Retention, 1/3 - 1/3 - 1/3 Diverted Sales)**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	
<i>Number of New Prescriptions and Physician Visits</i>												
[1]	Potential number of new DXM Rx (millions)	235	235	235	235	235	235	235	235	235	235	
[2]	Retention rate	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	
[3]	<b>New DXM prescriptions (millions)</b>	40	40	40	40	40	40	40	40	40	40	399
[4]	<b>Number of new physician visits (millions)</b>	13	13	13	13	13	13	13	13	13	13	133
<i>Physician Costs</i>												
Average physician cost per visit by payor type (\$)												
[5]	Public	73	75	77	79	81	83	85	87	89	92	
[6]	Private	112	112	112	113	113	113	113	114	114	114	
[7]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Population coverage not accounting for uninsured patients												
[8]	Public	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[9]	Private	62%	62%	62%	62%	62%	62%	62%	62%	62%	62%	
[10]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
[11]	<b>Total Cost (\$ millions)</b>	1,291	1,303	1,315	1,327	1,339	1,351	1,364	1,377	1,391	1,404	13,462
<i>DXM Drug Expenditures</i>												
[12]	Actual average DXM drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[13]	DXM price increase due to regime switch	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
[14]	Average DXM Rx drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[15]	<b>Total DXM drug expenditures following regime switch (\$ millions)</b>	315	323	331	340	349	358	367	377	386	396	3,542
<i>Work Absenteeism Costs (from new physician visits)</i>												
[16]	Total time diverted (hours)	2	2	2	2	2	2	2	2	2	2	
[17]	Average hourly wage (\$)	25.26	25.36	25.46	25.56	25.67	25.77	25.87	25.98	26.08	26.18	
[18]	Indirect costs	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[19]	Average hourly wage diverted (\$)	9.60	9.64	9.68	9.71	9.75	9.79	9.83	9.87	9.91	9.95	
[20]	<b>Total (\$ millions)</b>	258	259	260	261	262	263	264	265	266	267	2,623
<i>Diversion to Alternative Medication</i>												
[21]	Actual average drug price for other OTC drugs (\$/package)	8.57	8.79	9.02	9.26	9.50	9.75	10.00	10.26	10.53	10.80	
[22]	Average other Rx drug price (\$/package)	23.77	24.39	25.03	25.68	26.35	27.03	27.73	28.45	29.19	29.95	
[23]	Diverted DXM Rx sales (millions)	195	195	195	195	195	195	195	195	195	195	
[24]	DXM Rx diverted to other OTC drugs	65	65	65	65	65	65	65	65	65	65	
[25]	DXM Rx diverted to other Rx drugs	65	65	65	65	65	65	65	65	65	65	
[26]	Drug expenditures on other OTC drugs following regime switch (\$ millions)	557	571	586	602	617	633	650	667	684	702	
[27]	Drug expenditures on other Rx drugs following regime switch (\$ millions)	1,545	1,585	1,626	1,669	1,712	1,756	1,802	1,849	1,897	1,946	
[28]	<b>Total non-DXM drug expenditures following regime switch (\$ millions)</b>	2,102	2,157	2,213	2,270	2,329	2,390	2,452	2,516	2,581	2,648	23,657
[29]	<b>Total Cost (\$ millions)</b>	<b>3,966</b>	<b>4,041</b>	<b>4,118</b>	<b>4,197</b>	<b>4,278</b>	<b>4,362</b>	<b>4,447</b>	<b>4,534</b>	<b>4,624</b>	<b>4,716</b>	<b>43,284</b>

**Appendix C-2(f): DXM Prescription Cost Forecasts (No DXM Price Increase, 17% Retention, 1/3 - 1/3 - 1/3 Diverted Sales)**

**Notes & Sources:**

- [1] Exhibit A. It is assumed that every package of DXM actually sold OTC will translate into one Rx in the but-for world.
- [2] In this scenario, it is assumed that retention rate will be 17%.
- [3] = [1] \* [2].
- [4] = [1] \* [2] \* (1/3). It is assumed that 1/3 of the new DXM prescriptions will require a new physician visit.
- [5]-[7] Average physician cost for 2016 is from Appendix D. A compounded inflation rate of 2.6% after 2016 is applied. The 2.6% inflation rate is derived from the 2015 annual Consumer Price Index of medical care by all urban consumers. "Consumer Price Index - All Urban Consumers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CUUR0000SAM?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths).
- [8]-[10] Appendix E.
- [11] = [4] \* [5] \* [8] + [4] \* [6] \* [9]. Total physician cost weighted by payor type, based on number of new physician visits.
- [12] Exhibit A. The average DXM price is compounded at 2.6% after 2016.
- [13] It is assumed that there would be no price increase after the regime switch.
- [14] = [12] \* (1 + [13]).
- [15] = [3] \* [14].
- [16] 121 minutes. Ray, Kristin et al., "Opportunity Costs of Ambulatory Medical Care in the United States," American Journal of Managed Care, 21 (8), 2015 ("Ray et al. 2015"), pp. 567-574
- [17] The 2016 wage is set at the December 2015 U.S. average hourly wage from the Bureau of Labor Statistics, <http://www.bls.gov/news.release/empsit.t19.htm>. The wage is compounded at 0.4% after 2016. The 0.4% inflation rate is derived from the 2015 annual Consumer Price Index of all urban wage earners and clerical workers. "Consumer Price Index - Urban Wage Earners and Clerical Workers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CWUR0000SA0?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CWUR0000SA0?output_view=pct_12mths).
- [18] Indirect costs dues to work absenteeism are assumed to be 38% of average wages following Gifford, Brian, "The Cost of an Absence: IBI's Diverted Productivity Method," Integrated Benefits Institute, 2013, pp. 4-8.
- [19] = [17] \* [18].
- [20] = [4] \* [16] \* [19].
- [21] Exhibit A. The average package price for non-DXM OTC drugs is compounded at 2.6% after 2016.
- [22] Appendix B . The average package price for Rx drugs is compounded at 2.6% after 2016.
- [23] = [1] \* (1-[2]).
- [24]-[25] = [23] \* (1/3). It is assumed that the diverted DXM Rx sales are spilt equally three ways between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [26] = [21] \* [24].
- [27] = [22] \* [25].
- [28] = [26] + [27].
- [29] = [11] + [15] + [20] + [28].

**Appendix C-2(g): DXM Prescription Cost Forecasts (No DXM Price Increase, 25% Retention, 1/2 - 1/4 - 1/4 Diverted Sales)**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	
<i>Number of New Prescriptions and Physician Visits</i>												
[1]	Potential number of new DXM Rx (millions)	235	235	235	235	235	235	235	235	235		
[2]	Retention rate	25%	25%	25%	25%	25%	25%	25%	25%	25%		
[3]	<b>New DXM prescriptions (millions)</b>	59	59	59	59	59	59	59	59	59	587	
[4]	<b>Number of new physician visits (millions)</b>	20	20	20	20	20	20	20	20	20	196	
<i>Physician Costs</i>												
Average physician cost per visit by payor type (\$)												
[5]	Public	73	75	77	79	81	83	85	87	89	92	
[6]	Private	112	112	112	113	113	113	113	114	114	114	
[7]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Population coverage not accounting for uninsured patients												
[8]	Public	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[9]	Private	62%	62%	62%	62%	62%	62%	62%	62%	62%	62%	
[10]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
[11]	<b>Total Cost (\$ millions)</b>	1,899	1,916	1,933	1,951	1,969	1,987	2,006	2,025	2,045	2,065	19,797
<i>DXM Drug Expenditures</i>												
[12]	Actual average DXM drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[13]	DXM price increase due to regime switch	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
[14]	Average DXM Rx drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[15]	<b>Total DXM drug expenditures following regime switch (\$ millions)</b>	463	475	487	500	513	526	540	554	568	583	5,208
<i>Work Absenteeism Costs (from new physician visits)</i>												
[16]	Total time diverted (hours)	2	2	2	2	2	2	2	2	2	2	
[17]	Average hourly wage (\$)	25.26	25.36	25.46	25.56	25.67	25.77	25.87	25.98	26.08	26.18	
[18]	Indirect costs	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[19]	Average hourly wage diverted (\$)	9.60	9.64	9.68	9.71	9.75	9.79	9.83	9.87	9.91	9.95	
[20]	<b>Total (\$ millions)</b>	379	380	382	383	385	387	388	390	391	393	3,858
<i>Diversion to Alternative Medication</i>												
[21]	Actual average drug price for other OTC drugs (\$/package)	8.57	8.79	9.02	9.26	9.50	9.75	10.00	10.26	10.53	10.80	
[22]	Average other Rx drug price (\$/package)	23.77	24.39	25.03	25.68	26.35	27.03	27.73	28.45	29.19	29.95	
[23]	Diverted DXM Rx sales (millions)	176	176	176	176	176	176	176	176	176	176	
[24]	DXM Rx diverted to other OTC drugs	88	88	88	88	88	88	88	88	88	88	
[25]	DXM Rx diverted to other Rx drugs	44	44	44	44	44	44	44	44	44	44	
[26]	Drug expenditures on other OTC drugs following regime switch (\$ millions)	755	775	795	815	837	858	881	904	927	951	
[27]	Drug expenditures on other Rx drugs following regime switch (\$ millions)	1,047	1,074	1,102	1,131	1,160	1,190	1,221	1,253	1,286	1,319	
[28]	<b>Total non-DXM drug expenditures following regime switch (\$ millions)</b>	1,802	1,849	1,897	1,946	1,997	2,049	2,102	2,157	2,213	2,270	20,281
[29]	<b>Total Cost (\$ millions)</b>	<b>4,543</b>	<b>4,620</b>	<b>4,699</b>	<b>4,780</b>	<b>4,863</b>	<b>4,949</b>	<b>5,036</b>	<b>5,125</b>	<b>5,217</b>	<b>5,311</b>	<b>49,144</b>

**Appendix C-2(g): DXM Prescription Cost Forecasts (No DXM Price Increase, 25% Retention, 1/2 - 1/4 - 1/4 Diverted Sales)**

**Notes & Sources:**

- [1] Exhibit A. It is assumed that every package of DXM actually sold OTC will translate into one Rx in the but-for world.
- [2] In this scenario, it is assumed that retention rate will be 25%.
- [3] = [1] \* [2].
- [4] = [1] \* [2] \* (1/3). It is assumed that 1/3 of the new DXM prescriptions will require a new physician visit.
- [5]-[7] Average physician cost for 2016 is from Appendix D. A compounded inflation rate of 2.6% after 2016 is applied. The 2.6% inflation rate is derived from the 2015 annual Consumer Price Index of medical care by all urban consumers. "Consumer Price Index - All Urban Consumers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CUUR0000SAM?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths).
- [8]-[10] Appendix E.
- [11] = [4] \* [5] \* [8] + [4] \* [6] \* [9]. Total physician cost weighted by payor type, based on number of new physician visits.
- [12] Exhibit A. The average DXM price is compounded at 2.6% after 2016.
- [13] It is assumed that there would be no price increase after the regime switch.
- [14] = [12] \* (1 + [13]).
- [15] = [3] \* [14].
- [16] 121 minutes. Ray, Kristin et al., "Opportunity Costs of Ambulatory Medical Care in the United States," American Journal of Managed Care, 21 (8), 2015 ("Ray et al. 2015"), pp. 567-574
- [17] The 2016 wage is set at the December 2015 U.S. average hourly wage from the Bureau of Labor Statistics, <http://www.bls.gov/news.release/empsit.t19.htm>. The wage is compounded at 0.4% after 2016. The 0.4% inflation rate is derived from the 2015 annual Consumer Price Index of all urban wage earners and clerical workers. "Consumer Price Index - Urban Wage Earners and Clerical Workers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CWUR0000SA0?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CWUR0000SA0?output_view=pct_12mths).
- [18] Indirect costs dues to work absenteeism are assumed to be 38% of average wages following Gifford, Brian, "The Cost of an Absence: IBI's Diverted Productivity Method," Integrated Benefits Institute, 2013, pp. 4-8.
- [19] = [17] \* [18].
- [20] = [4] \* [16] \* [19].
- [21] Exhibit A. The average package price for non-DXM OTC drugs is compounded at 2.6% after 2016.
- [22] Appendix B . The average package price for Rx drugs is compounded at 2.6% after 2016.
- [23] = [1] \* (1-[2]).
- [24] = [24] \* (1/2). It is assumed that the diverted DXM Rx sales are spilt three ways (1/2, 1/4, 1/4) between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [25] = [24] \* (1/4). It is assumed that the diverted DXM Rx sales are spilt three ways (1/2, 1/4, 1/4) between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [26] = [21] \* [24].
- [27] = [22] \* [25].
- [28] = [27] + [28].
- [29] = [11] + [15] + [20] + [28].

**Appendix C-2(h): DXM Prescription Cost Forecasts (No DXM Price Increase, 17% Retention, 1/2 - 1/4 - 1/4 Diverted Sales)**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	
<i>Number of New Prescriptions and Physician Visits</i>												
[1]	Potential number of new DXM Rx (millions)	235	235	235	235	235	235	235	235	235		
[2]	Retention rate	17%	17%	17%	17%	17%	17%	17%	17%	17%		
[3]	<b>New DXM prescriptions (millions)</b>	40	40	40	40	40	40	40	40	40	399	
[4]	<b>Number of new physician visits (millions)</b>	13	13	13	13	13	13	13	13	13	133	
<i>Physician Costs</i>												
Average physician cost per visit by payor type (\$)												
[5]	Public	73	75	77	79	81	83	85	87	89	92	
[6]	Private	112	112	112	113	113	113	113	114	114	114	
[7]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Population coverage not accounting for uninsured patients												
[8]	Public	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[9]	Private	62%	62%	62%	62%	62%	62%	62%	62%	62%	62%	
[10]	Uninsured	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
[11]	<b>Total Cost (\$ millions)</b>	1,291	1,303	1,315	1,327	1,339	1,351	1,364	1,377	1,391	1,404	13,462
<i>DXM Drug Expenditures</i>												
[12]	Actual average DXM drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[13]	DXM price increase due to regime switch	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
[14]	Average DXM Rx drug price (\$/package)	7.88	8.09	8.30	8.51	8.73	8.96	9.19	9.43	9.68	9.93	
[15]	<b>Total DXM drug expenditures following regime switch (\$ millions)</b>	315	323	331	340	349	358	367	377	386	396	3,542
<i>Work Absenteeism Costs (from new physician visits)</i>												
[16]	Total time diverted (hours)	2	2	2	2	2	2	2	2	2	2	
[17]	Average hourly wage (\$)	25.26	25.36	25.46	25.56	25.67	25.77	25.87	25.98	26.08	26.18	
[18]	Indirect costs	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	
[19]	Average hourly wage diverted (\$)	9.60	9.64	9.68	9.71	9.75	9.79	9.83	9.87	9.91	9.95	
[20]	<b>Total (\$ millions)</b>	258	259	260	261	262	263	264	265	266	267	2,623
<i>Diversion to Alternative Medication</i>												
[21]	Actual average drug price for other OTC drugs (\$/package)	8.57	8.79	9.02	9.26	9.50	9.75	10.00	10.26	10.53	10.80	
[22]	Average other Rx drug price (\$/package)	23.77	24.39	25.03	25.68	26.35	27.03	27.73	28.45	29.19	29.95	
[23]	Diverted DXM Rx sales (millions)	195	195	195	195	195	195	195	195	195	195	
[24]	DXM Rx diverted to other OTC drugs	97	97	97	97	97	97	97	97	97	97	
[25]	DXM Rx diverted to other Rx drugs	49	49	49	49	49	49	49	49	49	49	
[26]	Drug expenditures on other OTC drugs following regime switch (\$ millions)	836	857	880	902	926	950	975	1,000	1,026	1,053	
[27]	Drug expenditures on other Rx drugs following regime switch (\$ millions)	1,159	1,189	1,220	1,251	1,284	1,317	1,352	1,387	1,423	1,460	
[28]	<b>Total non-DXM drug expenditures following regime switch (\$ millions)</b>	1,994	2,046	2,099	2,154	2,210	2,267	2,326	2,387	2,449	2,512	22,444
[29]	<b>Total Cost (\$ millions)</b>	<b>3,858</b>	<b>3,930</b>	<b>4,005</b>	<b>4,081</b>	<b>4,159</b>	<b>4,239</b>	<b>4,321</b>	<b>4,405</b>	<b>4,492</b>	<b>4,580</b>	<b>42,071</b>

**Appendix C-2(h): DXM Prescription Cost Forecasts (No DXM Price Increase, 17% Retention, 1/2 - 1/4 - 1/4 Diverted Sales)**

**Notes & Sources:**

- [1] Exhibit A. It is assumed that every package of DXM actually sold OTC will translate into one Rx in the but-for world.
- [2] In this scenario, it is assumed that retention rate will be 17%.
- [3] = [1] \* [2].
- [4] = [1] \* [2] \* (1/3). It is assumed that 1/3 of the new DXM prescriptions will require a new physician visit.
- [5]-[7] Average physician cost for 2016 is from Appendix D. A compounded inflation rate of 2.6% after 2016 is applied. The 2.6% inflation rate is derived from the 2015 annual Consumer Price Index of medical care by all urban consumers. "Consumer Price Index - All Urban Consumers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CUUR0000SAM?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths).
- [8]-[10] Appendix E.
- [11] = [4] \* [5] \* [8] + [4] \* [6] \* [9]. Total physician cost weighted by payor type, based on number of new physician visits.
- [12] Exhibit A. The average DXM price is compounded at 2.6% after 2016.
- [13] It is assumed that there would be no price increase after the regime switch.
- [14] = [12] \* (1 + [13]).
- [15] = [3] \* [14].
- [16] 121 minutes. Ray, Kristin et al., "Opportunity Costs of Ambulatory Medical Care in the United States," American Journal of Managed Care, 21 (8), 2015 ("Ray et al. 2015"), pp. 567-574
- [17] The 2016 wage is set at the December 2015 U.S. average hourly wage from the Bureau of Labor Statistics, <http://www.bls.gov/news.release/empsit.t19.htm>. The wage is compounded at 0.4% after 2016. The 0.4% inflation rate is derived from the 2015 annual Consumer Price Index of all urban wage earners and clerical workers. "Consumer Price Index - Urban Wage Earners and Clerical Workers," Bureau of Labor Statistics, [http://data.bls.gov/timeseries/CWUR0000SA0?output\\_view=pct\\_12mths](http://data.bls.gov/timeseries/CWUR0000SA0?output_view=pct_12mths).
- [18] Indirect costs dues to work absenteeism are assumed to be 38% of average wages following Gifford, Brian, "The Cost of an Absence: IBI's Diverted Productivity Method," Integrated Benefits Institute, 2013, pp. 4-8.
- [19] = [17] \* [18].
- [20] = [4] \* [16] \* [19].
- [21] Exhibit A. The average package price for non-DXM OTC drugs is compounded at 2.6% after 2016.
- [22] Appendix B . The average package price for Rx drugs is compounded at 2.6% after 2016.
- [23] = [1] \* (1-[2]).
- [24] = [24] \* (1/2). It is assumed that the diverted DXM Rx sales are spilt three ways (1/2, 1/4, 1/4) between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [25] = [24] \* (1/4). It is assumed that the diverted DXM Rx sales are spilt three ways (1/2, 1/4, 1/4) between non-DXM OTC medicine, cough and cold RX medicine, and consumers who would choose not to purchase any cold medicine after the regime switch).
- [26] = [21] \* [24].
- [27] = [22] \* [25].
- [28] = [27] + [28].
- [29] = [11] + [15] + [20] + [28].

## Appendix D: Cost of Physician Visits (\$)

Cost of Physician Visits	Range of Provider Cost (\$)	Average Provider Cost (\$)
	[a]	[b]
[1] Medicare / Medicaid	40-199	72.81
[2] Employer sponsored insurance	94-130	112
[3] Uninsured	n/a	486

### Notes and Sources:

- [1][a] Chapman, Richard, et al. "Managing Access to Pseudoephedrine / Potential Impacts of a Prescription-Only Policy versus Real-Time Stop Sale Technology," Avalere, April 2014 ("Avalere Report"), p. 35.
- [1][b] Avalere Report, p. 37.
- [2][a] Average of the range in [2][b].
- [2][b] Avalere Report, p. 33.
- [3] We assume that uninsured patients would pay the price of an emergency unit. See "Emergency Rooms vs. Urgent Care Centers: Differences in Services & Costs," Debt.org, <https://www.debt.org/medical/emergency-room-urgent-care-costs/>.

## Appendix E: Share of the Population by Insurance Coverage

	<b>2014</b>
<i>Population Coverage by Payor</i>	
[1] Public	34%
[2] Private	55%
[3] Uninsured	10%
<i>Population Coverage Not Accounting for Uninsured Patients</i>	
[4] Public	38%
[5] Private	62%
[6] Uninsured	n/a

### Notes & Sources:

It is assumed that uninsured patients would not go to a physician for a DXM prescription and would instead purchase alternative OTC medication or no medicine at all. These patients are already accounted for in the retention rate assumption. We, therefore, rescale the share of the population that would visit a physician to exclude uninsured patients and avoid double counting. Coverage by public and private insurances have been rescaled to 100%.

[1]-[3] "Health Insurance Coverage of the Total Population," Kaiser Family Foundation, 2014, <http://kff.org/other/state-indicator/total-population/>

[4] = [4] / ([4] + [5]).

[5] = [5] / ([4] + [5]).