

**Actuarial Assessment of House Bill 52:  
An Act to Provide Access to Hearing Aids for Children**

**Prepared for**

**Commonwealth of Massachusetts  
Division of Health Care Finance and Policy**

**Prepared by**

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**Actuarial Assessment of House Bill 52:  
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**EXECUTIVE SUMMARY**

House Bill 52, before the 2011-2012 Session of the Massachusetts legislature, mandates insurance coverage for hearing aid devices and related services for children. The Massachusetts Division of Health Care Finance and Policy (the Division) engaged Compass Health Analytics, Inc. to provide an actuarial estimate of the effect that enactment of the bill would have on the cost of health care insurance.

Compass analyzed the language of H.B. 52 and its relationship to existing mandate laws to determine the net effect of the proposed bill on coverage requirements. We conclude that the primary impact of the bill is to cover hearing aids and associated fitting services, with hearing evaluations already covered by existing mandates. This interpretation, and the lack of voluntarily-provided coverage for hearing aids, was confirmed by analysis of claims data for 2009 from the fully-insured commercial segment subject to the Commonwealth's benefit mandate laws. Claims for hearing evaluation averaged \$0.18 per member per month (PMPM), while claims for hearing aids averaged less than a tenth of a cent PMPM.

To estimate the cost of hearing aid devices and associated fitting services Compass used the following approach:

**Cost = Covered population**  
**x Hearing loss prevalence**  
**x Target Population Percentage**  
**x Hearing aid adoption rate among hard of hearing**  
**x Binaural rate (1 + percentage with correction in both ears)**  
**x Cyclical replacement factor (e.g., replacement time > 3 years)**  
**x Unit cost of hearing aid (and associated costs)**

The population for purposes of this analysis is the approximately 2 million Massachusetts residents insured under fully-insured products subject to the Commonwealth's statutory and regulatory authority. Published sources were used to estimate the rate of hard-of-hearing children in the population, the proportion of those for whom hearing aids are helpful, the rate at which those individuals adopt hearing aid use, and the proportion of those individuals using hearing aids in both ears (i.e., the binaural rate). The resulting number of potential hearing aids covered by insurance was modeled over the five year time horizon based on assumptions about how quickly eligible individuals begin using the benefit, and about the frequency with which the benefit would be accessed (no more than once per three years per ear, as specified in the bill).

The cost of this projected hearing aid utilization was estimated using average price data from the Division's claim database, confirmed by published sources. Cost estimates produced were adjusted to reflect increases in the hearing aid adoption rate among hard-of-hearing individuals and in higher average unit costs in response to the presence of insurance coverage. Finally, Compass added adjustments for administrative expense and risk/profit estimates for insurers to arrive at the total cost to premium payers.

The average net premium cost of H.B.52 over the next five years for fully-insured plans that would be subject to the proposed mandate is \$4.3 million, or 0.008% of premium. Due to the uncertainty associated with the degree to which hearing aid adopters exist in the population, and the behavioral response associated with the availability of an insurance benefit with a \$2,000 per device limit and a once per 36 month limit on replacement, the range of estimates is between 0.0004% of premium and 0.015% of premium. Table E-1 below summarizes the five-year effect on costs.

The three scenarios assume an average insurer-paid baseline cost per device of approximately \$1,400 when capped at \$2,000 per device. When adjusted for the estimated impact of insurance availability, these costs become \$1,621, \$1,652, and \$1,681 for the low, medium, and high scenarios respectively.

**Table E-1**  
**Summary of Cost Projection Scenarios for H.B. 52**

	2013	2014	2015	2016	2017	Average	5 Year Total
Members	1,986,462	1,965,622	1,944,347	1,923,077	1,901,099		
Medical Expense Low (\$000's)	\$ 483	\$ 375	\$ 368	\$ 452	\$ 355	\$ 407	\$ 2,033
Medical Expense Mid (\$000's)	\$ 1,156	\$ 664	\$ 664	\$ 1,139	\$ 665	\$ 858	\$ 4,288
Medical Expense High (\$000's)	\$ 2,407	\$ 1,029	\$ 1,037	\$ 2,409	\$ 1,059	\$ 1,588	\$ 7,942
Premium Low (\$000's)	\$ 531	\$ 412	\$ 404	\$ 498	\$ 390	\$ 447	\$ 2,236
Premium Mid (\$000's)	\$ 1,272	\$ 731	\$ 730	\$ 1,253	\$ 732	\$ 943	\$ 4,717
Premium High (\$000's)	\$ 2,648	\$ 1,132	\$ 1,141	\$ 2,650	\$ 1,165	\$ 1,747	\$ 8,736
PMPM Low	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02
PMPM Mid	\$ 0.05	\$ 0.03	\$ 0.03	\$ 0.05	\$ 0.03	\$ 0.04	\$ 0.04
PMPM High	\$ 0.11	\$ 0.05	\$ 0.05	\$ 0.11	\$ 0.05	\$ 0.07	\$ 0.07
Estimated Monthly Premium	\$ 464.21	\$ 487.42	\$ 511.79	\$ 537.38	\$ 564.25	\$ 512.46	\$ 512.46
Premium % Rise Low	0.005%	0.004%	0.003%	0.004%	0.003%	0.004%	0.004%
Premium % Rise Mid	0.011%	0.006%	0.006%	0.010%	0.006%	0.008%	0.008%
Premium % Rise High	0.024%	0.010%	0.010%	0.021%	0.009%	0.015%	0.015%

**Actuarial Assessment of House Bill 52:  
An Act to Provide Access to Hearing Aids for Children**

**1. INTRODUCTION**

House Bill 52 (HB52), before the 2011-2012 session of the Massachusetts legislature, mandates insurance coverage for hearing aid devices and related services and supplies for minor children age 21 or younger. The Massachusetts Division of Health Care Finance and Policy (the Division) engaged Compass Health Analytics, Inc. to provide an actuarial estimate of the effect that enactment of the bill would have on the cost of health insurance.

A description of the cost impact of this mandate will include analysis of incremental spending on those benefits to be provided by insurance plans subject to the law. This requires a comparison between current costs under existing statutes and benefit plans, to projected costs under the new legislation.

Section 2 outlines the provisions of the bill. Section 3 discusses the methodology and important considerations in translating the language of HB52 into estimates of incremental benefit use. Section 4 describes the data sources used for calculations, which are then detailed in the analysis and results described in Section 5.

**2. INTERPRETATION OF HB52**

The interpretation of HB52 lies in understanding the population which is covered by the mandate, the types of services described, and the description of existing mandates and legislation.

## 2.1 Insurance Entities Subject to HB52: Fully-Insured Plans

HB 52 amends the statutes that regulate insurers providing health insurance in Massachusetts by addressing statutes pertaining to particular types of health insurance policies through five separate sections<sup>1</sup>:

- Section 1: Group Insurance Commission coverage for state employees and retirees (amending G.L. c. 32A, §23)
- Section 2: Accident and sickness insurance policies (amending G.L. c. 175, § 47U)
- Section 3: Contracts with non-profit hospital service corporations (amending G.L. c. 176A, § 8U)
- Section 4: Certificates under medical service agreements (amending G.L. c. 176B, § 4U)
- Section 5: Health maintenance contracts (creating G.L. c. 176G, § 4N)

The bill applies only to any minor child age 21 or younger. Sections 1, 2 and 5 apply to all individuals covered under the plan, and sections 3 and 4 apply to plan members who are residents or who have a principal place of employment in the Commonwealth. Sections 3, 4 and 5 specifically exclude contracts providing coverage supplemental to Medicare or other governmental programs. HB52 effectively applies to insurance regulated by (issued in) Massachusetts, and residents who commute to other states and are insured in those states are generally not included in insurance roles, nor are they included in this analysis. Health insurance plans operated as self-insured entities (i.e., the employer policy holder retains the risk for medical expenditures and uses the insurer to provide administrative functions) are subject to federal law, and not to state-level mandates.

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<sup>1</sup> Some sections of the bill (i.e., sections 2 to 4) add a paragraph to statute sections dealing not with hearing-related services, but with emergency services. Legislative staff assured the Division that moving these paragraphs to more appropriate sections of the statutes will be addressed later. This report interprets the bill as if it updates or adds the language to the appropriate sections of the statutes.

## 2.2 Services Mandated by HB52

HB52 mandates coverage for:

- One hearing aid per hearing impaired ear every 36 months upon a written statement of medical necessity by the minor’s treating physician. Hearing aids are described as “a wearable aid or device... designed for or offered for the purpose of aiding or compensating for hearing loss.”<sup>2</sup> This definition explicitly excludes surgical implants, including abutments or cochlear implants; however, devices inserted directly into the ear or worn with an ear mold, as well as air conduction receivers and bone oscillator attachments (equipment only) are included. Coverage is limited to \$2000 per device.
- All related services prescribed by a licensed audiologist or hearing instrument specialist, including an initial evaluation, fitting and adjustments, and related supplies including ear molds and batteries<sup>3</sup>. These services and supplies are not subject to a coverage cap.

The insured is permitted to choose a higher priced hearing aid device and “may pay the difference in cost above the two thousand dollar (\$2000) limit as provided ... without any financial or contractual penalty to the insured or to the provider of the hearing aid.”<sup>4</sup>

Further, this benefit “shall not be subject to any greater deductible, coinsurance, copayments or out-of-pocket limits than any other benefits provided by the insurer.”<sup>5</sup> We interpret this to mean that, owing to federally prescribed preventive benefits paid with zero cost sharing, that no cost sharing would apply to this benefit.

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<sup>2</sup> Massachusetts General Laws, Public Health Definitions: Part I, Title XIV, Chapter 112 §196. Accessed 1/17/2012: <http://www.malegislature.gov/Laws/GeneralLaws/PartI/TitleXIV/Chapter112/Section196>

<sup>3</sup> While the language of HB 52 tends to point toward including batteries in the scope of coverage, some ambiguity might exist because the bill does not explicitly mention them. We follow the most likely reading of the bill’s language and assume they are covered. Our assumption is reinforced by explicit guidance from the bill’s sponsors in a meeting with them, legislative staff, and the Division, on December 20, 2011.

<sup>4</sup> Bill H.52: An Act to provide access to hearing aids for children. Accessed 1/17/2012: <http://www.malegislature.gov/Bills/187/House/H00052>

<sup>5</sup> *Ibid.*

### 2.3 Existing health benefit mandates relevant to treatments for hearing loss

While most private insurance plans in Massachusetts do not currently include coverage for hearing aids for children, there are several statutes requiring fully-insured health insurance plans (plans under which the insurance company bears the risk of medical expense) to provide coverage for at least some services related to hearing loss in children:

- Universal Newborn Hearing Screening (UNHS) mandates a hearing screening test for all newborns in the Commonwealth, to be performed in the hospital or birthing center prior to discharge. The program also mandates that if the screening test results indicate the need for additional audiological diagnostic examination, these additional tests shall be offered.<sup>6</sup>
- Early childhood sensory screening is mandated through age six for all dependent children of members of insurance plans.<sup>7</sup>
- Diagnosis and treatment of speech, hearing, and language disorders by speech-language pathologists or audiologists.<sup>8</sup> The mandate applies to residents and those having a principal place of employment within the Commonwealth. Hearing aid coverage is not included in the mandate.

There are also federally mandated programs that impact children with hearing loss:

- The Individuals with Disabilities Education Act of 2004 (IDEA) is intended to ensure educational and support services to children with disabilities, including deafness and hard of hearing. IDEA mandates that states and public organizations must provide special education and early intervention services to eligible infants, children and youth throughout the nation.<sup>9</sup> Part C of the

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<sup>6</sup> Massachusetts Session Laws, 1998: Chapter 243: An Act providing for hearing screening for newborns. Accessed 1/17/2012: <http://www.malegislature.gov/Laws/SessionLaws/Acts/1998/Chapter243>. G.L. c. 32A §7F, G.L. c. 111 §67F, G.L. c. 118E §10B, G.L. c. 175 §47C, G.L. 176A §8B, G.L. c. 176B §4C, G.L. c. 176G §4J.

<sup>7</sup> G.L. c. 175, § 47C, G.L. c. 176A, § 8B, G.L. c. 176B, § 4C, G.L. 176G, § 4.

<sup>8</sup> G.L. c. 175, § 47U, G.L. c. 176A, § 8U, G.L. c. 176B, § 4U, G.L. 176G, § 4N.

<sup>9</sup> Building the Legacy: IDEA 2004. Accessed 1/18/2012: <http://idea.ed.gov/>

Act outlines early intervention services for children from birth to age 2, while Part B details special education and services for children from age 3 to 21.

According to the American Speech-Language-Hearing Association, “[i]f a student is eligible for services under IDEA..., then schools are responsible to ensure that hearing aids worn in school are functioning properly. Moreover, hearing assistive technology must be provided if the student requires that service.”<sup>10</sup>

Generally, IDEA addresses device use only in the context of a child’s needs; specific devices are not outlined in the legislation. For children from birth through age 2, an Individualized Family Support Plan (IFSP) determines a child’s support needs to reach specific developmental milestones. For children ages 3 to 21, an Individualized Education Plan (IEP) describes the child’s needs in order to receive a free appropriate public education.

While interpretation of IDEA has not historically meant that the schools are responsible to pay for a child’s hearing aid, the devices are considered to be assistive technology which may be included in an IFSP or IEP, which is developed for each child eligible for IDEA-defined services.<sup>11,12,13</sup>

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<sup>10</sup> American Speech-Language-Hearing Association. Paying for Children’s Hearing Aids. Accessed 1/18/2012: <http://www.asha.org/public/hearing/Paying-for-Childrens-Hearing-Aids/>

<sup>11</sup> Amy S. Goldman, Associate Director, Institute on Disabilities at Temple University, Director, Pennsylvania Initiative on Assistive Technology, Pennsylvania Assistive Technology Learning Library, and the Mid-Atlantic Consortium on Accessible Information Technology in Education. Email correspondence 11/30/11.

<sup>12</sup> Anne Oyler, AuD, CCC-A, Audiology Professional Practices, American Speech-Language-Hearing Association. Email correspondence 12/5/11.

<sup>13</sup> In response to comments to more specifically define assistive technology devices as part of IDEA Part C, the U.S. Department of Education responded, “The definition of assistive technology device does not identify specific devices; including an exhaustive list of assistive technology devices in the definition would not be practical. Whether a hearing aid or an appropriate related audiological service is considered an assistive technology device or an early intervention service, respectively, for an infant or toddler with a disability depends on whether the device or service is used to increase, maintain, or improve the functional capabilities of the child and whether the IFSP Team determines that the infant or toddler needs the device or service in order to meet his or her specific developmental outcomes. Therefore, we have not revised this definition.” Federal Register, Volume 76, Number 188. Rules and Regulations, Pages 60140-60309, FR Doc No: 2011-22783, 28-September-2011. Accessed 1/18/2012: <http://www.gpo.gov/fdsys/pkg/FR-2011-09-28/html/2011-22783.htm>

For the purposes of this analysis, we will follow the historical interpretation of the IDEA legislation, and assume that a child's hearing aids are not paid for through the education or early intervention systems.

- The federal Early Hearing Detection and Intervention Act was reauthorized in December 2010. According to the Congressional Research Service, the Act “[a]mends the Public Health Service Act to...expand the newborn and infant hearing loss program to include diagnostic services...” along with screening, evaluation and intervention programs and systems.<sup>14</sup> The Act ensures continued funding and a broader set of services for screening and intervention systems aimed at identifying and supporting infants and children with hearing loss. Presumably, the potential effect of this Act will be to increase the number of children identified as deaf or hard-of-hearing, a certain number of whom will then use hearing aids. However, as the screening process in the Commonwealth already captures almost all children, the changes to EHDI should not result in an appreciable change to our assumptions.

For purposes of this analysis, we assume that the H.B. 52 will increase neither the number of children screened nor the number of children identified with hearing loss, owing to the already extensive and intensive hearing screening process carried out in the Commonwealth.

HB52 mandates coverage for hearing aids for children, and coverage for related services and supplies, including selection and fitting of devices, check and repairs, ear molds and batteries. Neither the devices nor the associated services and supplies are currently mandated for coverage by existing laws. Costs associated with these new benefits are the focus of this analysis, as they are incremental to the evaluation and diagnosis of hearing loss, and services which support proper function in educational and early intervention settings, which are included in other existing state and federal mandates.

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<sup>14</sup> National Center for Hearing Assessment and Management, Utah State University. EHDI Legislation Becomes Law. Accessed 1/18/2012: <http://www.infanthearing.org/legislation/federal.html>

### 3. METHODOLOGY AND FACTORS AFFECTING THE ANALYSIS

The approach used for estimating the baseline costs of hearing aid use in the child population is calculation of the following equation:

$$\begin{aligned} \text{Cost} &= \text{Covered population} \\ &\times \text{Hearing loss prevalence in children} \\ &\times \text{Target Population Percentage} \\ &\times \text{Hearing aid adoption rate among hard of hearing children} \\ &\times \text{Binaural rate (1+ percentage with correction in both ears)} \\ &\times \text{Cyclical replacement factor (e.g., one replacement per three years)} \\ &\times \text{Unit cost of hearing aid (up to \$2000) + associated costs} \end{aligned}$$

In this section, we discuss each of these factors and the relationships between them. The data used to quantify these factors is described in Section 4, and the application of the data to the methodology and the development of specific assumptions and calculations is discussed in Section 5.

#### 3.1 Covered population

HB52 applies to the commercial fully-insured population in Massachusetts population which is estimated to be 1.99 million persons in the first projection year of the analysis (2013), of which 577,000 are estimated to be 21 years of age or younger.<sup>15</sup>

#### 3.2 Hearing Loss Prevalence

Hearing loss rates for children can be estimated based primarily on statistics from the Universal Newborn Hearing Screening Program (UNHSP), a program mandated in the Commonwealth by the Massachusetts Legislature,<sup>16</sup> and administered within the Department of Public Health. This program requires that every newborn is screened for hearing loss before discharge from a hospital or birthing center following birth. Children who fail the initial screening are recommended to receive additional diagnostic audiology

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<sup>15</sup> Projections based on information from U.S. Census Bureau, statehealthfacts.org, GIC enrollment data, and reports published by the Division.

<sup>16</sup> *Op cit*, Massachusetts Session Laws, 1998: Chapter 243.

follow-up at any of twenty-nine audiology assessment/diagnostic centers throughout the Commonwealth, depending on age.<sup>17</sup> The details of both the initial screenings and follow-up assessments are compiled and submitted to the U.S. Centers for Disease Control Early Hearing Detection and Intervention Program (CDC-EHDIP).<sup>18</sup>

The 2009 prevalence rate for hearing loss in the UNHSP is 2.8 newborns per thousand, compared to the national average of 1.4 newborns per thousand.<sup>19</sup> There are several important factors about the UNHSP program in Massachusetts that impact the estimation of hearing loss prevalence in the state:

- The law in Massachusetts mandates that the hearing threshold for the screening program is set to 30 decibels (dBs), the lowest end of the screening spectrum recommended by the U.S. Preventive Services Task Force (USPSTF) in its 2008 statement. In its discussion of the burden of disease, the USPSTF states, “The targeted hearing loss for UNHS programs is permanent sensory or conductive hearing loss averaging 30 to 40 dB or more in the frequency region important for speech recognition (~500-4000 Hz).”<sup>20</sup> By setting the hearing loss threshold in Massachusetts at 30dBs, the screening will identify more children as needing follow-up assessment than would have been identified at a higher 40dB level.

Moreover, the results of follow-up assessments for children who fail their initial screening find that the type and severity of hearing loss identified in Massachusetts varies from the national average, as shown in the following table. The 2008 USPSTF summary, the latest for which data are available, shows that Massachusetts identified children with mild and moderate hearing

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<sup>17</sup> Massachusetts Executive Office of Health and Human Services. Audiological Assessment/Diagnostic Centers List. Accessed 1/19/2012: <http://www.mass.gov/eohhs/consumer/community-health/family-health/pregnancy-newborn/newborn-hearing-screen/audiological-assessmentdiagnostic-centers-list.html>

<sup>18</sup> U.S. Centers for Disease Control, Hearing Loss in Children. Accessed 1/19/2012: <http://www.cdc.gov/ncbddd/hearingloss/index.html>

<sup>19</sup> U.S. Centers for Disease Control, Summary of Diagnosis and Loss to Follow-up / Loss to Documentation in 2009, 2009 CDC EHDI Hearing Screening & Follow-up Survey (HSFS). Accessed 1/19/2012: [http://www.cdc.gov/ncbddd/hearingloss/2009-Data/2009\\_LFU\\_Summary\\_Web.pdf](http://www.cdc.gov/ncbddd/hearingloss/2009-Data/2009_LFU_Summary_Web.pdf)

<sup>20</sup> U.S. Preventive Services Task Force, Universal Screening for Hearing Loss in Newborns, July 2008. Accessed 1/19/2012: <http://www.uspreventiveservicestaskforce.org/uspstf08/newbornhear/newbhears.htm>

loss at a higher rate compared to the nation as a whole. Further, Massachusetts found a higher percentage of cases of conductive and unknown types of hearing loss than the national average. These findings may mean that testing in Massachusetts is more sensitive to hearing loss than in other states, and that the Commonwealth is identifying more cases than would have otherwise been recognized during the newborn/infant screening period. The comparisons are shown in Figure 1 below.

**Figure 1**

Comparison of Type and Severity of Identified Hearing Loss <sup>21</sup>										
	Type of Hearing Loss					Severity of Hearing Loss				
2008	Sensorineural	Conductive	Mixed	Unknown	Auditory Neuropathy	Mild	Moderate	Severe	Profound	Unknown
MA	48.4%	16.3%	9.2%	23.4%	2.7%	27.4%	46.0%	12.2%	10.1%	4.3%
US	66.1%	14.5%	7.2%	10.0%	2.1%	20.8%	33.4%	17.1%	16.9%	11.9%

- Massachusetts consistently ranks at or near the top of the nation in the number of children who are screened after birth. In 2009, the latest year for which data are available, Massachusetts screened 99.2% of newborns, compared with a national average of 97.4%; this placed the state among the top five in the nation for screenings.<sup>22</sup> Since more children are screened at birth, more children with hearing loss are identified early in life.
- The CDC-EHDIP also tracks loss-to-follow-up or lost-to-documentation cases, or those children for whom a follow-up assessment was recommended

<sup>21</sup> U.S. Centers for Disease Control, Summary of Laterality, Type and Severity of Identified Hearing Losses. 2008 CDC EHDI Hearing Screening and Follow-up Survey (HSFS). Accessed 1/20/2012: [http://www.cdc.gov/ncbddd/hearingloss/2008-data/2008\\_Type\\_Sev\\_Web\\_508.pdf](http://www.cdc.gov/ncbddd/hearingloss/2008-data/2008_Type_Sev_Web_508.pdf)

<sup>22</sup> U.S. Centers for Disease Control, 2009 Hearing Screening Summary, 2009 CDC EHDI Hearing Screening & Follow-up Survey (HSFS). Accessed 1/19/2012: [http://www.cdc.gov/ncbddd/hearingloss/2009-Data/2009\\_Screen\\_Web.pdf](http://www.cdc.gov/ncbddd/hearingloss/2009-Data/2009_Screen_Web.pdf)

but was never performed. These include cases where families were contacted but refused follow-up, cases that were unable to be contacted, and cases for which the loss-to-follow-up reason is unknown. In 2009, Massachusetts had by far the lowest number of loss-to-follow-up cases with 3.8% compared to the national average of 45.1%.<sup>23</sup> This means that the Massachusetts system is the best in the nation at completing follow-up diagnostic exams when a newborn fails an initial hearing assessment. Given this diligence, then, Massachusetts identifies more children with hearing loss than do other states.

The UNHSP estimates congenital hearing loss prevalence among newborns in the state, and must be adjusted to include children for whom hearing loss is discovered at a later stage of childhood. These include children whose congenital hearing loss was missed at birth (which would, based on the previously described information, be low in Massachusetts); children whose hearing loss is progressive, and may have been below the testing threshold at birth and became more severe and was thus found upon subsequent screening; or children for whom hearing loss was acquired, or developed later in childhood due to causes such as disease, certain medical conditions or injury.<sup>24</sup> Current estimates of the number of children who are found to be permanently hard of hearing outside of the newborn screening program vary significantly, estimating the number of cases at almost nothing,<sup>25</sup> to up to 30%.<sup>26</sup> The latest available data from the U.S. CDC survey estimates that the number of children identified with late onset hearing loss is approximately 14% in Massachusetts, or 17% nationally.<sup>27</sup>

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<sup>23</sup> *Op. cit.*, U.S. Centers for Disease Control, Summary of Diagnosis and Loss to Follow-up / Loss to Documentation in 2009.

<sup>24</sup> American Speech-Language-Hearing Association, Causes of Hearing Loss in Children. Accessed 1/19/2012: <http://www.asha.org/public/hearing/disorders/causes.htm#acquired>

<sup>25</sup> National Center for Hearing Assessment & Management, Utah State University. Issues & Evidence: Prevalence of Congenital Hearing Loss, 9/30/2010. Accessed 1/19/2012: <http://www.infantheating.org/summary/slides/slide16.gif>

<sup>26</sup> Young NM, Reilly BK, Burke L. Limitations of Universal Newborn Hearing Screening in Early Identification of Pediatric Cochlear Implant Candidates. *Arch Otolaryngol Head Neck Surg.* 2011;137(3):230-234. doi:10.1001/archoto.2011.4 Accessed 3/28/2012: <http://archotol.ama-assn.org/cgi/content/full/137/3/230>

<sup>27</sup> U.S. Centers for Disease Control, 2008 Hearing Screening Summary, 2008 CDC EHDI Hearing Screening & Follow-up Survey (HSFS), Cases of Other / Late Onset Permanent Hearing Loss (Year 2008), Footnote continued on next page

### 3.3 Target Population

Not every person with hearing loss can be helped by hearing aids. According to the National Institute on Deafness and Communication Disorders, people with sensorineural hearing loss, including those with mixed hearing loss (sensorineural and conductive hearing loss, for example), can be assisted through the use of hearing aids. Moreover, a small number of those with conductive hearing loss may also benefit from their use, set in this model at five percent of these cases. For cases in which the cause of hearing loss is initially reported as 'unknown,' the model assumes an eventual identification of cases which distributes 'unknown' cases among the other hearing loss types in proportion to the cases that could be identified in that year. Using data from 2005-2008, the estimated number of cases of hearing loss that can be assisted through the use of hearing aids ranges between 64.2% (2006) and 76.3% (2008).

### 3.4 Hearing Aid Adoption Rate

In order to estimate the number of hearing aids purchased with insurance coverage, the population of children who will use hearing aids must be understood. Likewise, this estimate should be based upon the number of children who are hard-of-hearing as defined in the previous section.

As with prevalence rates, hearing aid adoption rate approximations vary widely. In one national study conducted for the hearing aid industry, known as MarkeTrak XIII, the hearing aid adoption rate for children age 18 and younger was just 16.2%.<sup>28</sup> However, an annual study by the Gallaudet Research Institute which focused on students beginning at age 3, found that in 2011, 58.4% used hearing aids for classroom instruction nationally; the figure for Massachusetts was 52.3%.<sup>29</sup>

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December 2010. Accessed 3/29/2012: [http://www.cdc.gov/ncbddd/hearingloss/2008-data/2008\\_Other\\_Late\\_HL\\_Web.pdf](http://www.cdc.gov/ncbddd/hearingloss/2008-data/2008_Other_Late_HL_Web.pdf)

<sup>28</sup> Kochkin, Sergei. MarkeTrak XIII: 25 Year Trends in the Hearing Health Market. Table 5: Hearing aid adoption rates and populations by selected demography. Hearing Review, October 2009. Accessed 1/20/2012: [http://www.hearingreview.com/issues/articles/2009-10\\_01.asp](http://www.hearingreview.com/issues/articles/2009-10_01.asp)

<sup>29</sup> Gallaudet Research Institute (April 2011). State Summary Report of Data from the 2009-10 Annual Survey of Deaf and Hard of Hearing Children and Youth. Washington, DC: GRI, Gallaudet University. Accessed 1/20/2012: <http://research.gallaudet.edu/Demographics/States/2010/MA.pdf>

The lower Massachusetts number, relative to the national figure, may be a by-product of the composition of the children's hearing loss population in the state, as defined in the UNHS reports. As previously described, Massachusetts identifies more cases of congenital conductive hearing loss, which are less likely to be helped with hearing aids, and cases in the mild and moderate severity ranges, as compared to the national average. Consequently, the number of children for whom hearing aids are appropriate may be slightly lower than the national average, as reflected in the Gallaudet hearing aid adoption rate figures.

In a review of other states which analyzed the cost of mandating coverage for hearing aids for children, consensus on estimated hearing aid adoption rates is unclear. For example, a 2005 study for the New Hampshire Department of Insurance cited the MarkeTrak adoption rate of 13.3%.<sup>30</sup> Yet in a 2007 review of the issue, the California Health Benefits Review Program set adoption rates at 56.1%, based on the survey by the Gallaudet Research Institute.<sup>31</sup> Likewise, Maine cited the 2001-02 survey by Gallaudet in its 2003 report, stating that 63% of children with hearing loss use hearing aids.<sup>32</sup>

In discussions with the Newborn Hearing Screening Coordinator of a large health system, and staff of the Office of Specialty Services, Massachusetts Department of Public Health, anecdotal evidence provided set the adoption rate figure at the upper end of the spectrum, and cited the 52.3% figure provided by the Gallaudet Research Institute for Massachusetts as more realistic for purposes of this analysis.

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<sup>30</sup> Study of the Impact of House Bill 159: Coverage of Hearing Aids and Instruments. Prepared for the New Hampshire Insurance Department. Minneapolis, MN: ELH:mje:1108NH-HearingMandRpt, 1739-0001, p.5. Accessed 1/20/2012: [http://www.nh.gov/insurance/legal/documents/impact\\_sb159.pdf](http://www.nh.gov/insurance/legal/documents/impact_sb159.pdf)

<sup>31</sup> California Health Benefits Review Program (CHBRP). (2007). Analysis of Assembly Bill 368: Mandate to Offer Coverage for Hearing Aids for Children. Report to California State Legislature. Oakland, CA: CHBRP; 2007. CHBRP-07-01., p.7. Accessed 1/20/2012:

[http://www.chbrp.org/docs/index.php?action=read&bill\\_id=54&doc\\_type=3](http://www.chbrp.org/docs/index.php?action=read&bill_id=54&doc_type=3)

<sup>32</sup> Maine Bureau of Insurance. A Report to the Joint Standing Committee on Insurance and Financial Services of the 121st Maine Legislature Review and Evaluation of LD 1087, an Act to Require All Health Insurers to Cover the Cost of Hearing Aids, October 2003. Accessed 2/29/2012:

<http://www.maine.gov/pfr/legislative/documents/ld1087final.pdf>

### 3.5 Degree of Binaural Hearing Aid Adoption

Many children with hearing loss will utilize hearing aids in both ears, either because the loss is binaural or bilateral, or because the use of two hearing aids provides more appropriately balanced and clearer sound amplification. In a review of recent U.S. CDC data, the number of children with bilateral hearing loss ranges between 60-68% nationally.<sup>33,34</sup> Again citing the MarkeTrak XIII study, binaural use of hearing aids has grown steadily to about 80% of all hearing instrument owners of all ages nationally,<sup>35</sup> meaning that for each person with hearing loss, 1.8 hearing aids will be purchased.

### 3.6 Unit Costs

For each hearing aid purchased, the average unit cost of the device must be estimated. Since the recommended hearing aid is wholly dependent upon the user's individual situation, the nature of the devices and their features vary widely. The prices associated with them also vary widely along with their technical sophistication and features, so this average unit cost should reflect the likely mix of devices to be purchased under the proposed coverage, and should reflect the level of payment carriers would be likely to make under the coverage for any given device. As stated previously, children are most likely to use behind-the-ear models of hearing aids for a variety of reasons, including their bodies' continued growth, and the ease-of-use and adjustability of the devices themselves. Available claims data confirms that most children have purchased digital behind-the-ear models.

In educational and home settings, children frequently connect their hearing aids to hearing assistive technology systems. Therefore, the American Speech-Language-

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<sup>33</sup> U.S. Centers for Disease Control, 2008 Hearing Screening Summary, 2008 CDC EHDI Hearing Screening & Follow-up Survey (HSFS), Summary of Laterality, Type and Severity of Identified Hearing Losses:

By Ear, Year 2008, December 2010. Accessed 3/29/2012: [http://www.cdc.gov/ncbddd/hearingloss/2008-data/2008\\_Type\\_Sev\\_Web\\_508.pdf](http://www.cdc.gov/ncbddd/hearingloss/2008-data/2008_Type_Sev_Web_508.pdf)

<sup>34</sup> U.S. Centers for Disease Control, 2009 Hearing Screening Summary, 2009 CDC EHDI Hearing Screening & Follow-up Survey (HSFS), Type and Severity Summary of Identified Cases of Hearing Loss in 2009, December 2011. Accessed 3/29/2012: [http://www.cdc.gov/ncbddd/hearingloss/2009-Data/HSFS\\_2009\\_Part2\\_508.pdf](http://www.cdc.gov/ncbddd/hearingloss/2009-Data/HSFS_2009_Part2_508.pdf)

<sup>35</sup> *Op. cit.*, Kochkin, S.

Hearing Association recommends that hearing aids prescribed should have special features (telecoil and direct audio input capability) that will allow for this connection.<sup>36</sup>

### 3.7 Useful Life of Devices/Replacement Factor

Hearing aids have a technical useful life and a coverage useful life. HB52 limits coverage for devices to once every 36 months. However, a device's technical useful life will depend on design, technology changes and innovation, and the degree to which they may undergo abuse, which is relatively higher in the child population when compared to adults. Hearing aids may be replaced more or less frequently than their technical useful life, in part depending on the availability of insurance coverage. The analysis must make assumptions about how often individuals with hearing aids will replace their units under the mandated coverage.

### 3.8 Impact of Insurance Coverage

As private insurance coverage for hearing aids is not common, most people who are deaf or hard-of-hearing who use hearing aids pay for their devices and related services and supplies out-of-pocket. The availability of insurance coverage will shift these expenses to the insurer, and will presumably cause some of those who did not previously purchase hearing aids due to the expense to purchase the devices. There is evidence that the presence of insurance coverage is known to increase use of services.<sup>37</sup>

According to a survey of large carriers in Massachusetts conducted to support this study, insurers do not typically cover hearing aids for any insured member, although some offer coverage through a rider that the employer may choose to purchase. Respondents indicate that very few employer groups have opted for this benefit. Further, the benefit limit of these riders is fairly restrictive. For example, the typical benefit included as a rider for GIC plans covers the 100% of the first \$500 of charges for a hearing aid,

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<sup>36</sup> American Speech-Language-Hearing Association. Hearing Aids for Children. Accessed 1/20/2012: <http://www.asha.org/public/hearing/Hearing-Aids-for-Children/>

<sup>37</sup> Manning WG, Newhouse JP, Duan N, Keeler EB, Benjamin B, Liebowitz A, et al. Health insurance and the demand for medical care. Evidence from a randomized experiment. Santa Monica, CA: RAND Corporation, 1988. Report R-3476-HHS. ISBN 0-8330-0864-1.

following by 80% coverage of the next \$1500, up to \$1700 in total coverage per two year period. This means that the member's copayment will gradually increase at a rate of 20% of device costs between \$500 and \$2000 (at which point the patient portion equals 20% \*(\$2000-\$1500), or \$300), plus any amount charged over \$2000.

For purposes of this analysis, it is important to consider the additional effects the presence of coverage would likely have on both the decision to adopt use of a hearing aid and on the average features and cost of units purchased. While individuals may choose not to wear hearing aids for many reasons that have nothing to do with cost, the cost of the hearing aids will have an effect on the margin for some people and thus will affect the average adoption rate.

The \$2000 per device cap defined in HB52 will also impact our estimates. Some will limit their device purchase to hearing aids available under the \$2000 cap. Others may choose a more expensive technology than they would have otherwise purchased out-of-pocket, and pay the difference from the insured portion from their own funds “without any financial or contractual penalty to the insured or to the provider of the hearing aid.”<sup>38</sup> This analysis includes adjustments that attempt to capture these effects.

### 3.9 Costs of Related Supplies and Services

HB52 provides coverage for services and supplies related to the hearing aid, including the initial hearing aid evaluation, fitting and adjustments, and supplies including ear molds and batteries. As previously described, other mandates currently exist at both the state and federal levels that cover initial hearing aid evaluations for children. We will need, however, to estimate the additional costs of supplies and services in light of two key points:

- These costs are not capped under the \$2000 limit for hearing aid devices. Given this, we must consider the possibility of cost-shifting that may occur in response to the legislation. The effect of the \$2000 cap may be that some

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<sup>38</sup> *Op. cit.*, Bill H.52.

providers shift any marginal device expenses above \$2000 from the device charges to the related services and supplies charges.

- The costs of services and supplies related to hearing aids are higher in the child population when compared to the adult population for several reasons. First, as described earlier, children are much more likely to abuse their devices, requiring more frequent adjustments and repairs. Second, as children grow and develop, they are more able to respond to increasingly sophisticated hearing tests, which allow for more specific adjustments to elements such as frequency and amplification.<sup>39</sup> Third, children's ears are still growing. In part to accommodate this growth, the most common devices that infants and young children wear are behind-the-ear hearing aids (BTE), which includes an ear mold that can be formed to the shape of a child's ear.<sup>40</sup> These ear molds are replaced frequently for children, more often in infants and young children, and less often in older children whose rate of growth has slowed. Also, as ear molds are soft and pliable, they are often more comfortable for younger children.<sup>41</sup>

#### 4. DATA SOURCES

This analysis uses the following sources of information:

- *Health Care Quality and Cost Council HCQCC data:* The Division provided 2009 claim-level data collected from five major carriers for both fully-insured and self-insured plans. The data were used primarily to evaluate current average unit costs and reimbursements for devices under the limited current coverage, and to evaluate the costs of related services and accessories.

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<sup>39</sup> *Op. cit.*, American Speech-Language-Hearing Association. Hearing Aids for Children.

<sup>40</sup> U.S. Centers for Disease Control and Prevention. Hearing Loss in Children: Treatment and Intervention Services. Accessed 1/20/2012: <http://www.cdc.gov/ncbddd/hearingloss/treatment.html>

<sup>41</sup> *Op. cit.*, American Speech-Language-Hearing Association. Hearing Aids for Children.

- *GIC data:* Because health insurance for state employees provides coverage for hearing aids, the Group insurance Commission (GIC) was able to provide data on device utilization and cost for children for 2011.
- *Carrier questionnaires:* Carriers responded to a request from the Division for information about current coverage for hearing aids.
- *Literature and published studies:* The analysis draws on published studies for information about the prevalence and nature of hearing loss and the use of hearing aids. They are noted where relevant in the body of this report.

## 5. ANALYSIS AND RESULTS

### 5.1 Existing Coverage

Table 1 below was prepared using the Division’s claim database for 2009. It displays per member per month (PMPM) costs for categories of services related to hearing and hearing aids. The existing mandates related to hearing screening for children and the services of audiologists for diagnosis of hearing-related problems are apparent in the significant costs associated with hearing tests.

**Table 1**  
**Annual Claim Costs with Existing Coverage**  
**Massachusetts Fully Insured Commercial**

2009 PMPM* Costs	
	Child (0-21)
Accessories	\$ 0.000042
Device - Binaural	\$ 0.000173
Device - Monaural	\$ 0.000955
Hearing Aid Services	\$ 0.000101
Hearing Tests	\$ 0.178834
<b>Grand Total</b>	<b>\$ 0.18</b>

\* Claims for members age 0-21  
divided by total membership

The results of the carrier survey indicated that none of the participating carriers cover hearing aids or associated services as part of their standard benefit packages. Most

indicated that they offer hearing aid coverage as an optional rider for large employers interested in including this coverage. That coverage typically involves fairly restrictive caps on per device costs. The coverage provided by the Group Insurance Commission (GIC) for state and selected local municipality employees is illustrative.<sup>42</sup> Their benefit pays for 100% of the first \$500 and 80% of the next \$1500, once every two years for hearing aids only.

The limited availability of coverage for hearing aids for children is reflected in the PMPMs for the rows in Table 1, other than testing. These numbers reflect the total amount of hearing aid and associated service paid claims in the child population (for those limited number having the benefit) divided by the entire fully insured population. As a result, the PMPM levels are nearly immaterial. Since we do not have information on specific carrier accounts and their associated members and costs, we cannot isolate subsets of claims and members with a hearing aid benefit in force to get representative PMPM values that might be used as estimates of the PMPM costs for the whole population. In the next subsection we use specific facts that we can calculate from the claims (such as per-device unit costs) and use those in conjunction with information from the published literature to construct hearing aid device costs as the key input into estimating insurance coverage costs for HB52.

## 5.2 Calculation of Hearing Aid Device Costs

As discussed in Section 3, the basic approach taken in this analysis to calculating hearing aid costs uses the following formula:

$$\begin{aligned}
 \text{Cost} &= \text{Covered population} \\
 &x \text{ Hearing loss prevalence in children} \\
 &x \text{ Target population percentage} \\
 &x \text{ Hearing aid adoption rate among hard of hearing children} \\
 &x \text{ Binaural rate (1+ percentage with correction in both ears)} \\
 &x \text{ Cyclical replacement factor (e.g., one replacement per three years)} \\
 &x \text{ Unit cost of hearing aid (up to \$2,000) + associated costs}
 \end{aligned}$$

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<sup>42</sup>The GIC plans are largely self-insured and therefore most of the information on access to their benefit is not reflected in Table 1. In any case, the GIC is not separately identifiable in the data.

This section describes baseline estimates of the costs for the Massachusetts fully insured population; adjustments to this baseline to reflect the behavioral effects associated with the presence of insurance coverage will be outlined in section 5.3. As the claims database available for this analysis does not include sufficient information for all variables to enable the calculation of PMPM costs for those population subsets with hearing aid coverage and therefore does not support generalization to the entire fully insured population, many of the estimates included are based on published data and previously described studies. However, any valid information from the claims database is included and described where appropriate. Estimates are developed in three scenarios, a most likely or mid level, bracketed by low and high scenarios. The low and high scenarios contain assumptions which deviate from the most likely assumptions in a plausible manner which would lower the estimated total cost of the mandate (low) and increase the estimated total cost (high).

Table 2 summarizes the assumptions developed for children on hearing loss prevalence, target population (the subset for whom hearing aids are helpful), adoption rates, binaural rates, and unit costs (replacement cycles are discussed in section 5.4). The table summarizes these four key parameters for the three scenarios (low, mid, high) developed in this analysis.

**Table 2**  
**Summary of Key Assumptions for Hearing Aid Use**

Hearing Loss Rate	Low	0.14%
	Mid	0.19%
	High	0.24%
Targeted Population	Low	64.20%
	Mid	73.15%
	High	82.10%
Hearing Aid Adoption Rate	Low	65.00%
	Mid	70.00%
	High	75.00%
Binaural Rate	Low	1.60
	Mid	1.65
	High	1.70

The hearing loss rate ranges are set based on consideration of the CDC's 1.4 per thousand estimate of hearing loss and the Massachusetts-specific experience of 2.8 per thousand. Since the hearing aid adoption rates (see immediately below) are generally derived from national populations, it is likely that the higher screened rates in Massachusetts result in less severe average hearing loss relative to the national population, and thus lower adoption rates (see Figure 1). For the target population able to benefit from hearing aids, we use a range around the percentages cited in Section 3 of those with hearing loss who can be helped by hearing aids.

In addition to the widely varying adoption rates in the literature, we also consider input from an audiologist who cited adoption rates at 75% and up for those in the target population. Adjusting the literature-based estimates (which are population-based) to the target population produces a more limited range. For example, the Gallaudet rate of 52.3% adjusted for the target population percentages produces rates between 70% and 80%. Taking into account the effect discussed above related to the higher percentage of individuals identified with hearing loss, the range was reduced somewhat to between 65% and 75%.

From the hearing loss rate, the target population rate, and the adoption rate, we calculate a prevalence rate of children using hearing aids. In addition, we use the 2011 GIC hearing aid claim data provided by the GIC (which covers hearing aids) to estimate the hearing aid prevalence rate and compare this to our assumptions as a reasonableness check. In our assumptions, the prevalence rate is equal to the product of the hearing loss rate, the targeted population, and the hearing aid adoption rate. This calculation results in a range of estimated prevalence rates of 0.06% to 0.15% with a mid-level value of 0.10%. This calculation does not take into account the effect on demand of the introduction of insurance coverage (discussed in Section 5.3). When the demand effect is factored in, the range of estimates becomes 0.06% to 0.19% with a mid-level value of 0.12%. This is in comparison to an estimate produced from the GIC claims.

The GIC hearing aid benefits are available to members every two years. Therefore, with only one year's worth of claim data we are not able to easily identify the total number of hearing aid users in the GIC population. Using the claim data and some basic assumptions, we estimate a range of prevalence rates for comparison. Based on the claim data, the GIC had 43 hearing aid users ages 0 to 24 purchase hearing aids in 2011. If we assume that hearing aid users utilize their benefits when they are available every two years and the number of users with claims in 2011 is half of the total number of hearing aid users ages 0 to 24 in the population, we calculate an estimated prevalence rate of 0.10%. This rate would be on the low end of the range of estimates. At the high end of the range, we assume that hearing aid users ignore the availability of benefits and replace their hearing aids closer to the high end of the useful life of a hearing aid, every four years. This results in an estimated prevalence rate of 0.19%. A mid-level estimate of 0.14% is based on replacement every three years.<sup>43</sup> These rates are somewhat higher than the rates calculated from our assumptions, but within a similar range when the effect of demand on the introduction of insurance coverage is considered. The GIC claim data would already reflect most of the demand effect since the benefits are available for this population, although the benefits are not as rich as those in HB52.

The rate of binaural hearing correction in effect converts “bodies” into “ears.” That is, all hearing aid adopters who use two hearing aids account for use of two rather than one per person, which must be factored in when converting from hearing aid users to hearing aids purchased. Available data discussed in Section 3 suggest approximately two thirds of child hearing aid users are binaural; we use a range of 1.6 to 1.7 for the binaural factor.

Multiplying the binaural rate times the previously calculated product of the rate of hearing loss, the targeted population, and the rate of hearing aid adoption, we calculate an approximate number of “hearing aids in use.” To develop cost estimates we then need to apply per-device costs. The average unit cost of a hearing aid is calculated from the Division's claim data for 2009. The amount of data available for hearing aids for children

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<sup>43</sup> We will assume that the prevalence rate for children ages 0 to 21 is the same as we have estimated for children ages 0 to 24.

21 and younger in the database is limited so we consider both fully-insured and self-insured claims in our analysis in order to have more data points when calculating the average unit cost. For purposes of this analysis, we consider a “unit” to be a single hearing aid. Thus, a monaural device is considered one “unit” and a binaural device is considered two “units” as it is two hearing aids. This is necessary in order to calculate the impact of HB52’s benefit limits of \$2000 per hearing aid per hearing-impaired ear. To measure the unit cost we look at the billed charge amounts. This is the amount that the provider has billed the carrier for the service, not necessarily what the carrier will pay for the service. We can not calculate a true unit cost using the allowed charge because we found that this amount is often limited to the carrier’s benefit level and therefore depresses the true actual cost of the device. Based on the claim data, the average unit cost of a hearing aid in 2009 for children 21 and younger was \$1,651. If we apply HB52’s benefit limits, the capped average unit cost is \$1,412, as reflected in Table 3.

**Table 3**  
**Summary of Key Assumptions for Cost**

2009 Average Hearing Aid Unit Cost		\$ 1,651
Capped at \$2,000 per Hearing Aid		\$ 1,412
Dispensing Fee Cost	Low	\$ 150
	Mid	\$ 175
	High	\$ 200
Service and Accessories Cost	Low	\$ 210
	Mid	\$ 240
	High	\$ 270

Table 3 also includes the additional costs associated with device purchase, fitting, and maintenance. These costs were based on interviews with a director of audiology at a large Massachusetts medical center.

### 5.3 Adjustments for Coverage Behavior Effects and Timing

For purposes of developing an impact estimate, the calculations described above fail to reflect two important factors:

- The behavioral impact on device volumes and average prices induced by coverage will increase costs;
- The timing of hearing aid purchases (not all will happen at once), will significantly reduce the annual outlay required.

While, in general, the presence of insurance coverage clearly affects consumer behavior, we are not aware of information that provides clear evidence of how much coverage for hearing aids specifically affects the decisions to adopt hearing aids and the decision of how expensive a purchased hearing aid will be.<sup>44</sup> There is a significant literature on the more general question of demand response to increased insurance coverage or “demand elasticity.” An average estimate of general demand elasticity is -0.17, which means that a one percent decrease in the price of health care will lead to a 0.17% increase in health care expenditures.<sup>45</sup> However, this inelastic demand response is applicable to generally small changes in price, such as the change in a copayment level. Larger price changes, such as the introduction of coverage for a previously uncovered service, have been found to have larger responses, on the order of -0.7.<sup>46</sup>

The first question then is to what extent non-adopters will be converted to adopters due to the presence of coverage. The methodology used above to estimate hearing aid costs already captures the costs for hearing aid adopters in the population. Many factors prevent people with hearing loss from wearing hearing aids; the removal of cost as a barrier could be expected to induce some non-adopters to become adopters, but we assume for this analysis that the effect is relatively modest (between a 10% and 30% increase applied to the baseline adoption rate) relative to the adjustment implied by the -0.7% elasticity owing to stigma and other non-financial reasons for not adopting hearing aids. These assumptions are reflected in Table 4.

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<sup>44</sup> Note that the data used for the baseline adoption rate comes from a general population which is generally lacking in coverage for hearing devices. As a result, we believe making the adjustment for the effect of coverage is appropriate.

<sup>45</sup> Ringel, J.S., et. al. (2002), “The elasticity of demand for health care, a review of the literature and its application to the military health system,” RAND.

<sup>46</sup> Eichner, M.J. (1998), “The demand for medical care: What people pay does matter,” *American Economic Review* 88(2): 117-121, May.

**Table 4**

**Insurance Coverage Impact on Use and Price**

Hearing Aid Adoption Rate	Low	1.10
	Mid	1.20
	High	1.30
Average Unit Cost	Low	1.45
	Mid	1.60
	High	1.75

In addition to an effect on the number of units covered, the availability of coverage could be expected to have a stronger effect on the average features and purchase price of the units. That is, we would expect individuals to consider and purchase more expensive units when their marginal cost is zero or 20% under coverage than they would when a cap makes their out of pocket marginal cost 100% of the additional price. Again, specific data or studies on hearing aids to make these adjustments are lacking, but failing to reflect the effect would likely lead us to underestimate the cost. We assume that the incentive to purchase more expensive hearing aids for those adopting them is made primarily based on the financial incentive and that there will be larger response than for the adoption rate. While the data used for average unit cost comes from insurance claims/coverage data, as noted, these purchases were made under benefits that are relatively restricted (particularly price caps) compared to the provisions of HB52. As a result, we assume that the average purchase price of units, which vary widely, would be between 45% and 75% higher. Table 4 displays these assumptions.

Table 5 displays our original assumptions from Table 2, adjusted for the behavioral responses displayed in Table 4.

**Table 5**  
**Adjusted Assumptions for Hearing Aid Cost Calculations**

		Original	Elasticity	Adjusted
Hearing Loss Rate	Low	0.14%		0.14%
	Mid	0.19%		0.19%
	High	0.24%		0.24%
Targeted Population	Low	64.20%		64.20%
	Mid	73.15%		73.15%
	High	82.10%		82.10%
Hearing Aid Adoption Rate	Low	65.00%	1.10	71.50%
	Mid	70.00%	1.20	84.00%
	High	75.00%	1.30	97.50%
Binaural Rate	Low	1.60		1.60
	Mid	1.65		1.65
	High	1.70		1.70
Average Hearing Aid Unit Cost Capped at \$2,000 per Hearing Aid	Low		1.45	\$ 1,621
	Mid	\$ 1,412	1.60	\$ 1,652
	High		1.75	\$ 1,681

The basic population characteristics related to hearing loss rate and binaural rate have not changed, but the behavioral parameters related to adoption rate and average unit cost (related to the features and expense of the unit) have increased relative to Table 2. To calculate the adjusted average hearing aid unit costs we apply the elasticity factors to the individual claim amounts in the Division’s claim data, apply the \$2000 per hearing aid cap, and then calculate the resulting average unit cost.

We combine the assumptions in Table 5 reflecting the behavioral effects on adoption rates and unit costs into a cost estimate to generate a starting point for estimating the coverage costs for HB52. The costs calculated and displayed in Table 6 illustrate the use of the mid-level assumptions for the cost calculation and represent the “immediate replacement cost for all hearing aids in use.” That is, based on the estimated number of hearing aids in use in the affected population and the average prices as reflected in the current limited number of cases where coverage is provided, we calculate the costs that would be incurred for devices if all were purchased at one time. Under the mid-level scenario assumptions, total replacement cost is approximately \$1.8 million.

**Table 6**  
**Covered Cost for Children Aged 0-21**  
**Immediate Replacement for all Hearing Aid Users**  
**Mid-Level Scenario**

User Cost Calculation 2013	
Enrollment	576,569
Hearing Loss Rate	0.19%
Targeted Population	73.15%
Hearing Aid Adoption Rate	84.00%
Binaural Rate	1.65
Hearing Aids in Use after coverage	1,111
Average Unit Cost capped at \$2,000	\$ 1,652
Total Replacement Cost (\$000's)	\$ 1,835

5.4 Annual Costs: Purchase timing and associated service costs

Not all devices will be purchased simultaneously. To arrive at annual cost estimates, we need to make an assumption about what proportion of potential purchases would occur in the first year the coverage becomes available (assumed to be 2013), and also about how often they are subsequently replaced. The overall five-year average costs are affected by the initial purchase rate assumption, but moderated such that anyone purchasing in year 1 cannot purchase in years 2 and 3. So, for example, if 100% of potential units were purchased in the first year, the numbers purchased in years 2 and 3 would be zero. Consequently, this assumption is material but not critical to the overall results. For the three scenarios, we have assumed the initial purchase rate is 40%, 50%, and 60% for the low, mid, and high scenarios respectively.

The frequency of replacement also requires assumption. HB52 allows coverage for purchase for each affected ear once every 36 months. Table 7 displays the assumed replacement schedules under three different scenarios.

**Table 7****Assumed Replacement Schedule for Hearing Aid Users**

Scenario	2013	2014	2015	2016	2017
Low	40%	30%	30%	40%	30%
Mid	50%	25%	25%	50%	25%
High	60%	20%	20%	60%	20%

Table 8 displays conversion of the full-population replacement costs in Table 6 and timing assumptions in Table 7 into five year projections of cost. The row displaying “Hearing Aid Paid Dollars Total” reflects the calculations using the assumptions discussed and displayed above for the mid-level scenario. Note that the assumptions about replacement and the 36 month requirement make the annual costs for this mandate “lumpy” or variable from year to year.

**Table 8****Five-Year Projection of Purchase Behavior and Associated Cost for Hearing Aids****Mid-Level Scenario**

	2013	2014	2015	2016	2017	5 Year Avg
Population (Children <= 21)	576,569	568,430	560,755	554,010	547,774	
Hearing Aid Users After Coverage	673	664	655	647	640	
Hearing Aids in Use After Coverage	1,111	1,095	1,080	1,067	1,055	
Replacement Factor	50%	25%	25%	50%	25%	
Hearing Aids Purchased with Coverage	555	274	270	534	264	
Hearing Aid Inflation/Technology *	100%	100%	100%	100%	100%	
Average Hearing Aid Unit Cost Capped at \$2,000/Unit	\$ 1,652	\$ 1,652	\$ 1,652	\$ 1,652	\$ 1,652	
Hearing Aid Paid Dollars Total (\$000's)	\$ 918	\$ 452	\$ 446	\$ 882	\$ 436	
Other Services Inflation **	108%	104%	104%	104%	104%	
Dispensing Fee	\$ 189	\$ 197	\$ 205	\$ 213	\$ 221	
Service and Accessories	\$ 260	\$ 270	\$ 281	\$ 292	\$ 304	
Dispensing Fee Paid Dollars Total (\$000's)	\$ 64	\$ 33	\$ 34	\$ 69	\$ 35	
Service and Accessories Paid Dollars Total (\$000's)	\$ 175	\$ 179	\$ 184	\$ 189	\$ 194	
Net Claims Dollars (\$000's)	\$ 1,156	\$ 664	\$ 664	\$ 1,139	\$ 665	\$ 858
Total Dollars with Administrative Load (\$000's)	\$ 1,272	\$ 731	\$ 730	\$ 1,253	\$ 732	\$ 943
Membership	1,986,462	1,965,622	1,944,347	1,923,077	1,901,099	
PMPM with no Admin Load	\$ 0.05	\$ 0.03	\$ 0.03	\$ 0.05	\$ 0.03	
PMPM with Administrative Load	\$ 0.05	\$ 0.03	\$ 0.03	\$ 0.05	\$ 0.03	
Premium	\$ 464.21	\$ 487.42	\$ 511.79	\$ 537.38	\$ 564.25	
Percent of Premium	0.011%	0.006%	0.006%	0.010%	0.006%	0.008%

Table 8 also displays the effects of three additional factors we must consider to estimate the cost of the mandate. First, costs for related services required by the mandate (in addition to the devices themselves) must be considered. Second, costs must be adjusted

over time to reflect inflation. Third, insurers' administrative costs (a fundamental component of premium cost) must be added in.

Additional costs for related items and services required by the mandate are based on interviews with an audiologist at a large Massachusetts medical center. Dispensing fees are incurred at the time of hearing aid purchase and have been included based on the assumed replacement schedule. Additional costs for services and accessories are assumed to be annual costs incurred for each hearing aid user.

Over time, costs can be expected to increase with inflation. Device costs may also increase as technology advances. As such, adjustments have been made in Table 8 to both the hearing aid unit costs and the additional costs for related items and services. The hearing aid unit costs inflation/technology factor is expected to be minimal (and negative in the low-level scenario), because as hearing aid technology advances, the cost of the older technology devices will decrease. The dispensing fees and other services and accessories are assumed to increase over time based on CPI for medical services, which has averaged 4% historically.

Using historical retention data from studies published by the Division<sup>47</sup>, we estimate retention ratios – the portion of premiums that represent administration costs and profit for bearing risk on the covered members – of approximately 10% for the projected years. Table 8 displays the resulting net effect on premiums, showing the net increase measured on a PMPM basis and an increase as a percentage of estimated premiums for the mid-level scenario.

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<sup>47</sup> Massachusetts Division of Health Care Finance and Policy. Massachusetts Health Care Cost Trends, May 2011. Accessed 4/12/2012: <http://www.mass.gov/eohhs/docs/dhcfp/cost-trend-docs/cost-trends-docs-2011/premium-report.pdf> and Massachusetts Division of Health Care Finance and Policy. Massachusetts Health Care Cost Trends: Premiums and Expenditures Appendix A, May 2012. Accessed 5/21/2012: <http://www.mass.gov/eohhs/docs/dhcfp/cost-trend-docs/cost-trends-docs-2012/premiums-and-expenditures-appendix-a.pdf>

Table 9 displays the summary of costs for all three scenarios. Five-year average percent of premium impacts are estimated to be 0.008% in the mid-level scenario, with an average PMPM of \$0.04. The percent of premium ranges from 0.004% in the low-level scenario to 0.015% in the high-level scenario.

**Table 9**  
**Summary of Cost Scenarios for H.B. 52**

	2013	2014	2015	2016	2017	Average	5 Year Total
Members	1,986,462	1,965,622	1,944,347	1,923,077	1,901,099		
Medical Expense Low (\$000's)	\$ 483	\$ 375	\$ 368	\$ 452	\$ 355	\$ 407	\$ 2,033
Medical Expense Mid (\$000's)	\$ 1,156	\$ 664	\$ 664	\$ 1,139	\$ 665	\$ 858	\$ 4,288
Medical Expense High (\$000's)	\$ 2,407	\$ 1,029	\$ 1,037	\$ 2,409	\$ 1,059	\$ 1,588	\$ 7,942
Premium Low (\$000's)	\$ 531	\$ 412	\$ 404	\$ 498	\$ 390	\$ 447	\$ 2,236
Premium Mid (\$000's)	\$ 1,272	\$ 731	\$ 730	\$ 1,253	\$ 732	\$ 943	\$ 4,717
Premium High (\$000's)	\$ 2,648	\$ 1,132	\$ 1,141	\$ 2,650	\$ 1,165	\$ 1,747	\$ 8,736
PMPM Low	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02
PMPM Mid	\$ 0.05	\$ 0.03	\$ 0.03	\$ 0.05	\$ 0.03	\$ 0.04	\$ 0.04
PMPM High	\$ 0.11	\$ 0.05	\$ 0.05	\$ 0.11	\$ 0.05	\$ 0.07	\$ 0.07
Estimated Monthly Premium	\$ 464.21	\$ 487.42	\$ 511.79	\$ 537.38	\$ 564.25	\$ 512.46	\$ 512.46
Premium % Rise Low	0.005%	0.004%	0.003%	0.004%	0.003%	0.004%	0.004%
Premium % Rise Mid	0.011%	0.006%	0.006%	0.010%	0.006%	0.008%	0.008%
Premium % Rise High	0.024%	0.010%	0.010%	0.021%	0.009%	0.015%	0.015%

### 5.5 Impact on GIC

The GIC provided claim data related to hearing aid devices and related services provided in 2011 to their members ages 0 to 24. While HB52 is only applicable to children ages 21 and under, this data set will help provide an estimated impact of HB52 on the GIC if they should choose to voluntarily modify their benefits to match its provisions.

The GIC hearing aid benefits are available to members every two years. With only one year's worth of claim data we are not able to identify the total number of hearing aid users in the GIC population. We developed a range of estimates to use in our calculations of the impact. Based on the claim data, the GIC had 43 hearing aid users ages 0 to 24 purchase hearing aids in 2011. If we assume that hearing aid users utilize their benefits when they are available every two years, and the number of users with claims in 2011 is half of the total number of hearing aid users ages 0 to 24 in the population, we calculate an estimated prevalence rate of 0.10%. This rate would be on the low end of the range of

estimates. At the high end of the range, we assume that hearing aid users ignore the availability of benefits and replace their hearing aids closer to the high end of the useful life of a hearing aid, every four years. This results in an estimated prevalence rate of 0.19%. A mid-level estimate of 0.14% is based on replacement every three years. We assume that the prevalence rate for children ages 0 to 21 is the same as we have estimated for children ages 0 to 24.

With a hearing aid benefit already in place, we do not anticipate an increase in the prevalence rate of hearing aid users due to the introduction of HB52 for the GIC population, so the estimated prevalence rates are not adjusted for an insurance impact.

Of the 43 members purchasing hearing aids in 2011, 25 purchased monaural units and 18 purchased binaural units. Using this data, we estimate a binaural rate of 1.42 for the GIC members ages 0 to 21. This rate is much lower than the binaural rates assumed in the calculations described earlier. This could be due to the limited amount of claim data available for analysis for the GIC. We assume this rate is the low end of the range of estimates, use the same high end rate from the previous analysis (1.70), and use the midpoint for the mid-level estimate (1.56).

We then use these estimated prevalence and binaural rates in the cost calculation described in the previous sections to find a range of estimates for the GIC's costs under HB52. The calculations result in overall five-year average costs ranging from \$77K to \$219K. However, if we assume that the GIC's costs would be equal to what they were in 2011 without HB52, \$62K for children ages 0 to 24, then the estimated net impact would be in the range of \$15K to \$157K. A more involved estimation method could be used to calculate this impact, but the net impact of the change in benefit levels for the GIC would remain very small.

## **6. CONCLUSION**

Hearing aids are rarely covered by commercial insurance currently in Massachusetts. Hearing testing, covered by existing mandates, is a frequently used benefit in the fully

insured population, with over 50,000 children tested annually. Passage of HB52 would provide insurance coverage for devices and associated services that are fairly well understood with respect to their average cost per device (approximately \$1,400 with the bill's cap, over \$1,600 after allowing for the effects of insurance coverage). Less well understood is how the presence of insurance coverage would affect that average cost, and what proportion of the population would benefit and decide to proceed with the use of one or two hearing aids. Based on published rates of hearing loss and hearing aid adoption, a sensitivity analysis suggests that the projected per member per month costs would have a mid-level PMPM cost of \$0.04 PMPM, which represents approximately 0.008% of annual premium. Due to the uncertainty associated with both the degree to which hearing aid adopters exist in the children's population and the behavioral response associated with the availability of an insurance benefit with a \$2000 per device price cap (but a once per 36 month limit on replacement), the range of estimates is between 0.004% of premium and 0.015% of premium.

## APPENDIX A: CALCULATIONS FOR THREE COST SCENARIOS

## Low-Level Scenario

### Covered Cost for Immediate Replacement for all Hearing Aid Users Low-Level Scenario

User Cost Calculation 2013	
Enrollment (Children ages 0 to 21)	576,569
Hearing Loss Rate	0.14%
Targeted Population	64.20%
Hearing Aid Adoption Rate	71.50%
Binaural Rate	1.60
Hearing Aids in Use after coverage	593
Average Unit Cost capped at \$2,000	\$ 1,590
Total Replacement Cost (\$000's)	\$ 943

### Five-Year Projection of Purchase Behavior and Associated Cost for Hearing Aids Low-Level Scenario

	2013	2014	2015	2016	2017	5 Year Avg
Population (Children <= 21)	576,569	568,430	560,755	554,010	547,774	
Hearing Aid Users After Coverage	371	365	360	356	352	
Hearing Aids in Use After Coverage	593	584	577	570	563	
Replacement Factor	40%	30%	30%	40%	30%	
Hearing Aids Purchased with Coverage	237	175	173	228	169	
Hearing Aid Inflation/Technology *	92%	98%	98%	98%	98%	
Average Hearing Aid Unit Cost Capped at \$2,000/Unit	\$ 1,590	\$ 1,558	\$ 1,527	\$ 1,496	\$ 1,467	
Hearing Aid Paid Dollars Total (\$000's)	\$ 377	\$ 273	\$ 264	\$ 341	\$ 248	
Other Services Inflation **	106%	103%	103%	103%	103%	
Dispensing Fee	\$ 159	\$ 164	\$ 169	\$ 174	\$ 179	
Service and Accessories	\$ 223	\$ 229	\$ 236	\$ 243	\$ 251	
Dispensing Fee Paid Dollars Total (\$000's)	\$ 24	\$ 18	\$ 18	\$ 25	\$ 19	
Service and Accessories Paid Dollars Total (\$000's)	\$ 83	\$ 84	\$ 85	\$ 87	\$ 88	
Net Claims Dollars (\$000's)	\$ 483	\$ 375	\$ 368	\$ 452	\$ 355	\$ 407
Total Dollars with Administrative Load (\$000's)	\$ 531	\$ 412	\$ 404	\$ 498	\$ 390	\$ 447
Membership	1,986,462	1,965,622	1,944,347	1,923,077	1,901,099	
PMPM with no Admin Load	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02	
PMPM with Administrative Load	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02	\$ 0.02	
Premium	\$ 464.21	\$ 487.42	\$ 511.79	\$ 537.38	\$ 564.25	
Percent of Premium	0.005%	0.004%	0.003%	0.004%	0.003%	0.004%

\* Hearing Aid Inflation for 2013 covers the 2009 to 2013 period to inflate the 2009 data source to 2013 dollars.

\*\* Other Services Inflation for 2013 covers the 2011 to 2013 period to inflate the 2011 data source to 2013 dollars.

## Mid-Level Scenario

### Covered Cost for Immediate Replacement for all Hearing Aid Users Mid-Level Scenario

User Cost Calculation 2013	
Enrollment (Children ages 0 to 21)	576,569
Hearing Loss Rate	0.19%
Targeted Population	73.15%
Hearing Aid Adoption Rate	84.00%
Binaural Rate	1.65
Hearing Aids in Use after coverage	1,111
Average Unit Cost capped at \$2,000	\$ 1,652
Total Replacement Cost (\$000's)	\$ 1,835

### Five-Year Projection of Purchase Behavior and Associated Cost for Hearing Aids Mid-Level Scenario

	2013	2014	2015	2016	2017	5 Year Avg
Population (Children <= 21)	576,569	568,430	560,755	554,010	547,774	
Hearing Aid Users After Coverage	673	664	655	647	640	
Hearing Aids in Use After Coverage	1,111	1,095	1,080	1,067	1,055	
Replacement Factor	50%	25%	25%	50%	25%	
Hearing Aids Purchased with Coverage	555	274	270	534	264	
Hearing Aid Inflation/Technology *	100%	100%	100%	100%	100%	
Average Hearing Aid Unit Cost Capped at \$2,000/Unit	\$ 1,652	\$ 1,652	\$ 1,652	\$ 1,652	\$ 1,652	
Hearing Aid Paid Dollars Total (\$000's)	\$ 918	\$ 452	\$ 446	\$ 882	\$ 436	
Other Services Inflation **	108%	104%	104%	104%	104%	
Dispensing Fee	\$ 189	\$ 197	\$ 205	\$ 213	\$ 221	
Service and Accessories	\$ 260	\$ 270	\$ 281	\$ 292	\$ 304	
Dispensing Fee Paid Dollars Total (\$000's)	\$ 64	\$ 33	\$ 34	\$ 69	\$ 35	
Service and Accessories Paid Dollars Total (\$000's)	\$ 175	\$ 179	\$ 184	\$ 189	\$ 194	
Net Claims Dollars (\$000's)	\$ 1,156	\$ 664	\$ 664	\$ 1,139	\$ 665	\$ 858
Total Dollars with Administrative Load (\$000's)	\$ 1,272	\$ 731	\$ 730	\$ 1,253	\$ 732	\$ 943
Membership	1,986,462	1,965,622	1,944,347	1,923,077	1,901,099	
PMPM with no Admin Load	\$ 0.05	\$ 0.03	\$ 0.03	\$ 0.05	\$ 0.03	
PMPM with Administrative Load	\$ 0.05	\$ 0.03	\$ 0.03	\$ 0.05	\$ 0.03	
Premium	\$ 464.21	\$ 487.42	\$ 511.79	\$ 537.38	\$ 564.25	
Percent of Premium	0.011%	0.006%	0.006%	0.010%	0.006%	0.008%

\* Hearing Aid Inflation for 2013 covers the 2009 to 2013 period to inflate the 2009 data source to 2013 dollars.

\*\* Other Services Inflation for 2013 covers the 2011 to 2013 period to inflate the 2011 data source to 2013 dollars.

## High-Level Scenario

### Covered Cost for Immediate Replacement for all Hearing Aid Users High-Level Scenario

User Cost Calculation 2013	
Enrollment (Children ages 0 to 21)	576,569
Hearing Loss Rate	0.24%
Targeted Population	82.10%
Hearing Aid Adoption Rate	97.50%
Binaural Rate	1.70
Hearing Aids in Use after coverage	1,883
Average Unit Cost capped at \$2,000	\$ 1,709
Total Replacement Cost (\$000's)	\$ 3,218

### Five-Year Projection of Purchase Behavior and Associated Cost for Hearing Aids High-Level Scenario

	2013	2014	2015	2016	2017	5 Year Avg
Population (Children <= 21)	576,569	568,430	560,755	554,010	547,774	
Hearing Aid Users After Coverage	1,108	1,092	1,077	1,064	1,052	
Hearing Aids in Use After Coverage	1,883	1,856	1,831	1,809	1,789	
Replacement Factor	60%	20%	20%	60%	20%	
Hearing Aids Purchased with Coverage	1,130	371	366	1,086	358	
Hearing Aid Inflation/Technology *	108%	102%	102%	102%	102%	
Average Hearing Aid Unit Cost Capped at \$2,000/Unit	\$ 1,709	\$ 1,716	\$ 1,724	\$ 1,731	\$ 1,739	
Hearing Aid Paid Dollars Total (\$000's)	\$ 1,931	\$ 637	\$ 631	\$ 1,879	\$ 622	
Other Services Inflation **	110%	105%	105%	105%	105%	
Dispensing Fee	\$ 221	\$ 232	\$ 243	\$ 255	\$ 268	
Service and Accessories	\$ 298	\$ 313	\$ 328	\$ 345	\$ 362	
Dispensing Fee Paid Dollars Total (\$000's)	\$ 147	\$ 51	\$ 52	\$ 163	\$ 56	
Service and Accessories Paid Dollars Total (\$000's)	\$ 330	\$ 341	\$ 354	\$ 367	\$ 381	
Net Claims Dollars (\$000's)	\$ 2,407	\$ 1,029	\$ 1,037	\$ 2,409	\$ 1,059	\$ 1,588
Total Dollars with Administrative Load (\$000's)	\$ 2,648	\$ 1,132	\$ 1,141	\$ 2,650	\$ 1,165	\$ 1,747
Membership	1,986,462	1,965,622	1,944,347	1,923,077	1,901,099	
PMPM with no Admin Load	\$ 0.10	\$ 0.04	\$ 0.04	\$ 0.10	\$ 0.05	
PMPM with Administrative Load	\$ 0.11	\$ 0.05	\$ 0.05	\$ 0.11	\$ 0.05	
Premium	\$ 464.21	\$ 487.42	\$ 511.79	\$ 537.38	\$ 564.25	
Percent of Premium	0.024%	0.010%	0.010%	0.021%	0.009%	0.015%

\* Hearing Aid Inflation for 2013 covers the 2009 to 2013 period to inflate the 2009 data source to 2013 dollars.

\*\* Other Services Inflation for 2013 covers the 2011 to 2013 period to inflate the 2011 data source to 2013 dollars.

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