

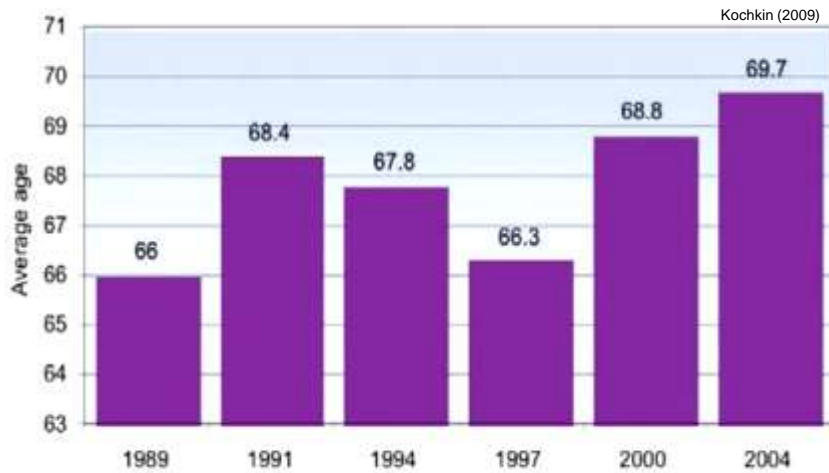
MISSED OPPORTUNITIES

AMYN M. AMLANI, PH.D.
UNIVERSITY OF NORTH TEXAS

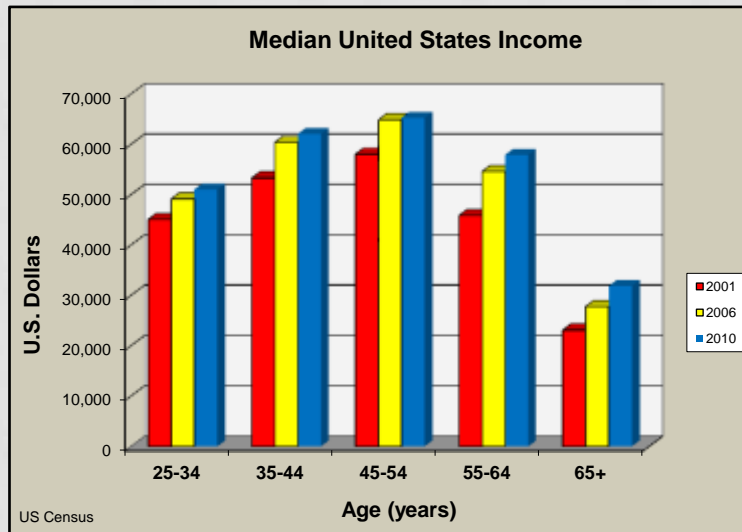


MARKET LANDSCAPE

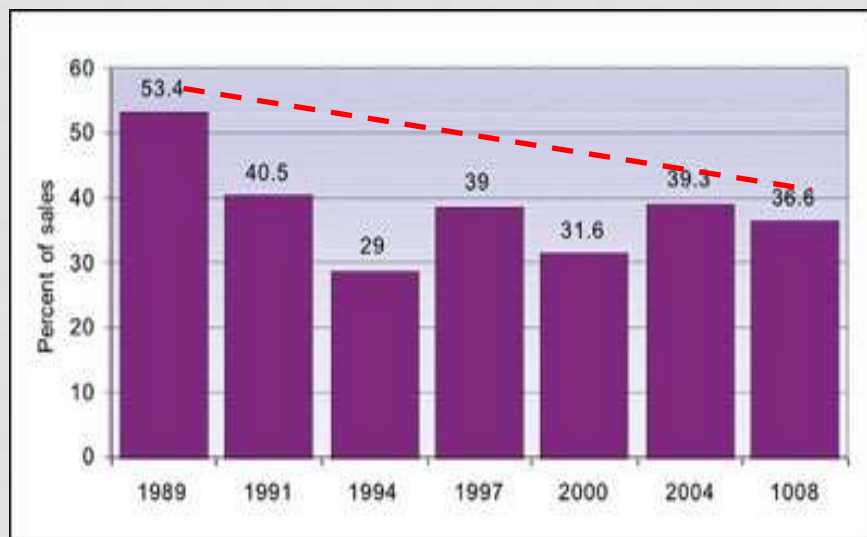
ADOPTER CHARACTERISTICS

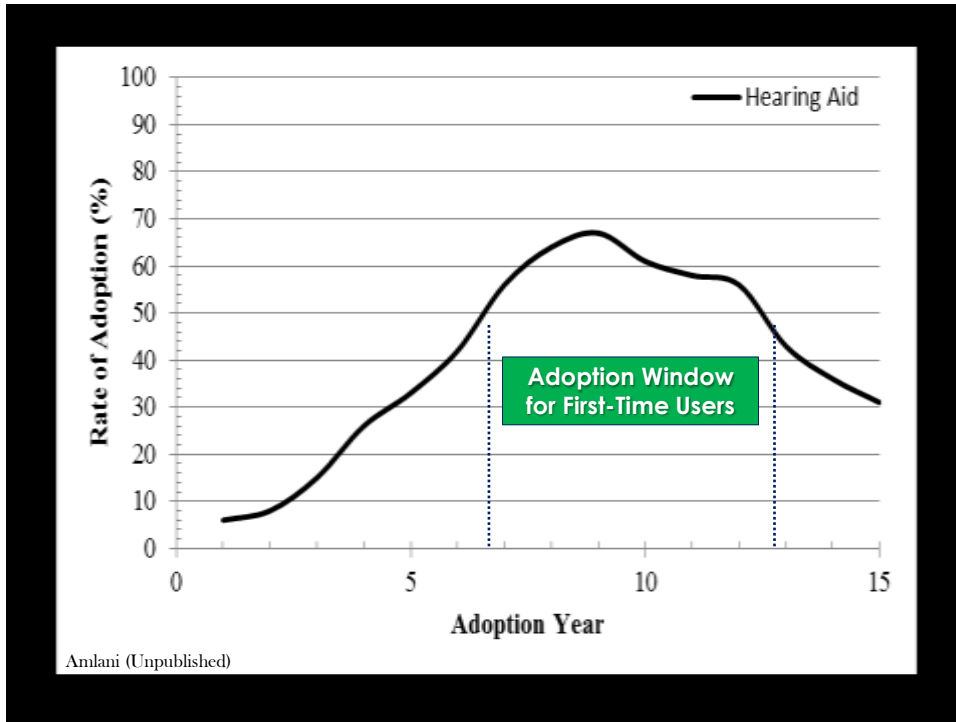


ADOPTER CHARACTERISTICS



ADOPTER CHARACTERISTICS – FIRST-TIME USERS

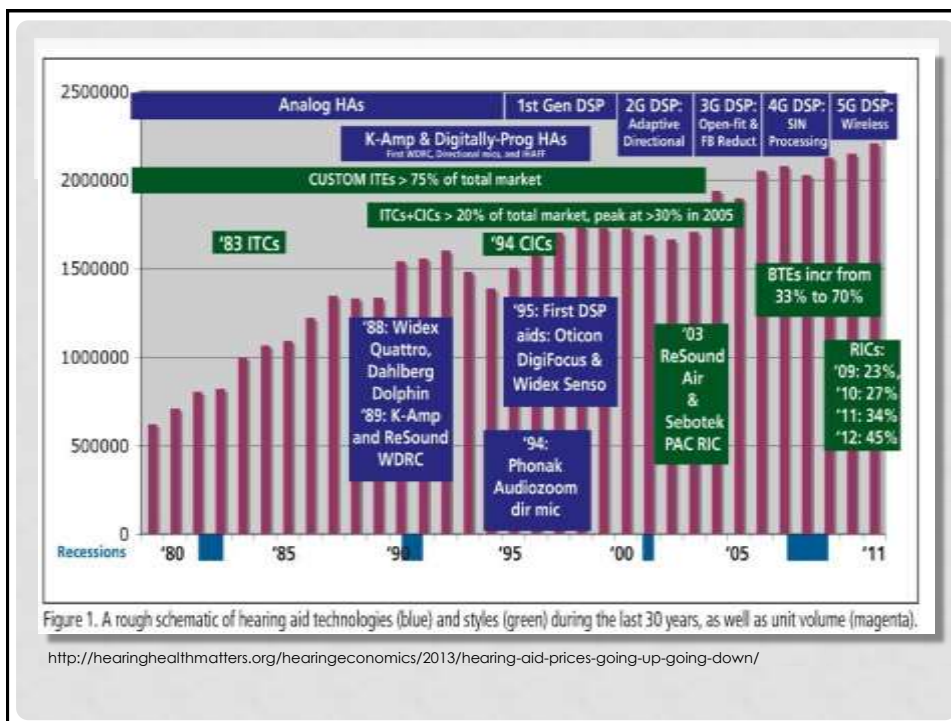
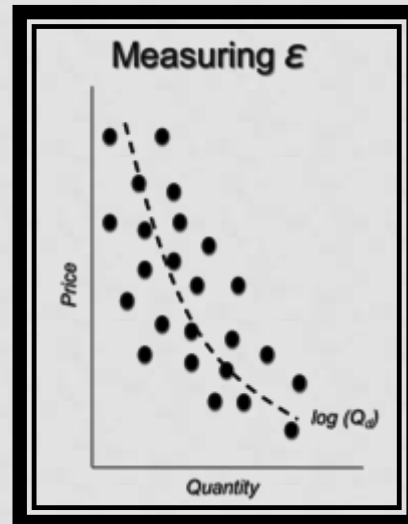


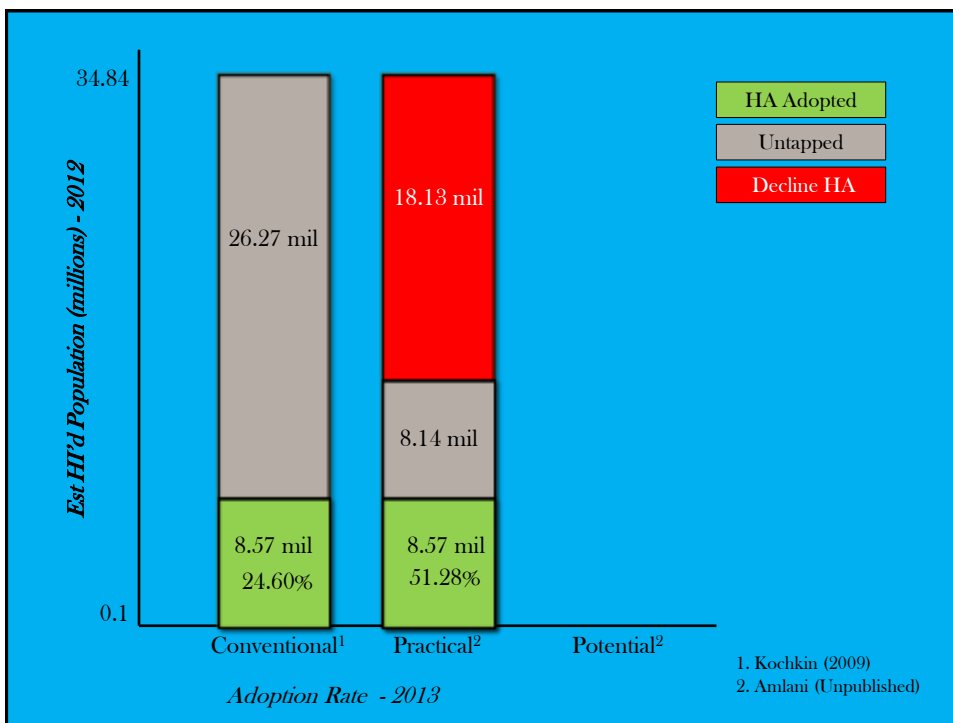
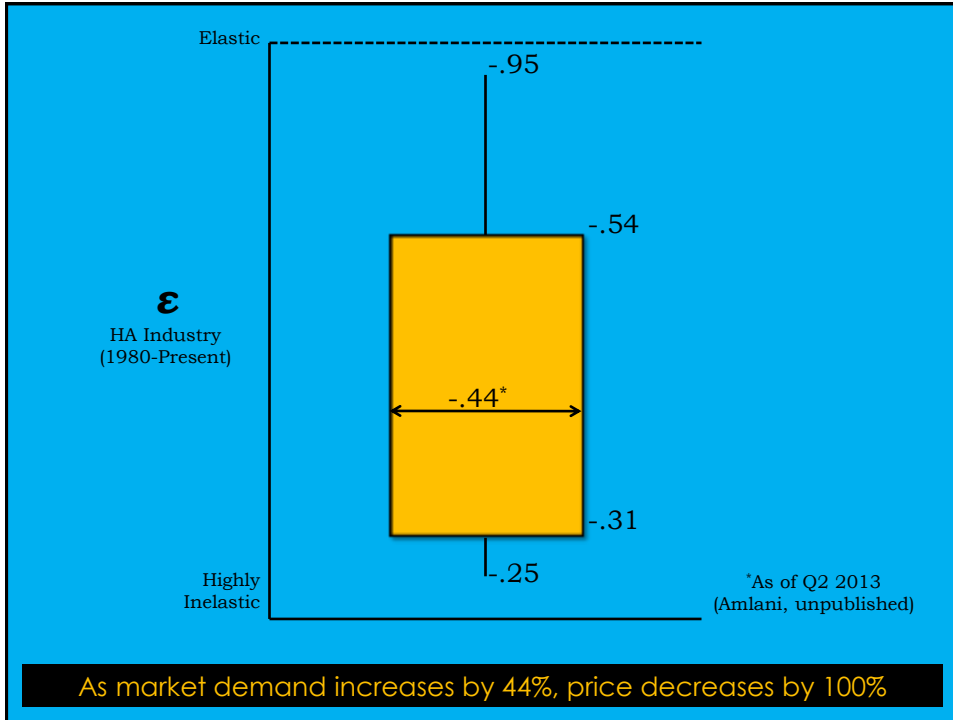


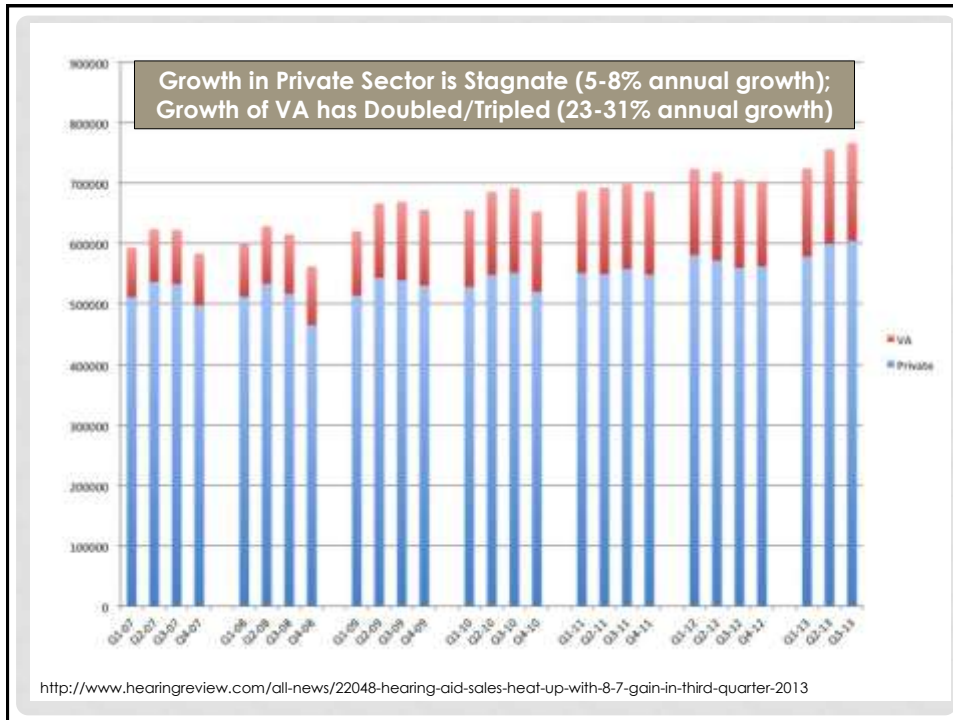
ECONOMIC LANDSCAPE

DEMAND AND HEARING AID MARKET

- Demand function (ϵ) within the hearing aid market is inelastic (Aaron, 1987; Lee & Lotz, 1998; Amlani & De Silva, 2005; Amlani, 2010)
 - An inelastic market means that consumers are **not** price sensitive (i.e., $\epsilon < |1|$)
 - No depreciable decline in quantity sold when price is increased
 - No appreciable increase in quantity sold when price is decreased



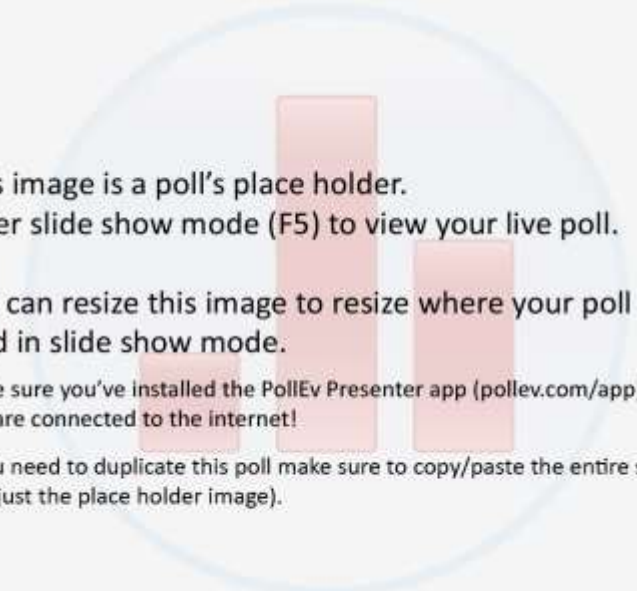




QUESTION 1

- **Who is the bigger threat to the demand of hearing aids?**

- A. "Big-box" retail chains (e.g., Costco)
- B. Hearing aid manufacturer-owned practices

A large, faint watermark graphic in the background of the slide, consisting of a light blue circle containing three vertical red bars of varying heights, resembling a bar chart.

This image is a poll's place holder.
Enter slide show mode (F5) to view your live poll.

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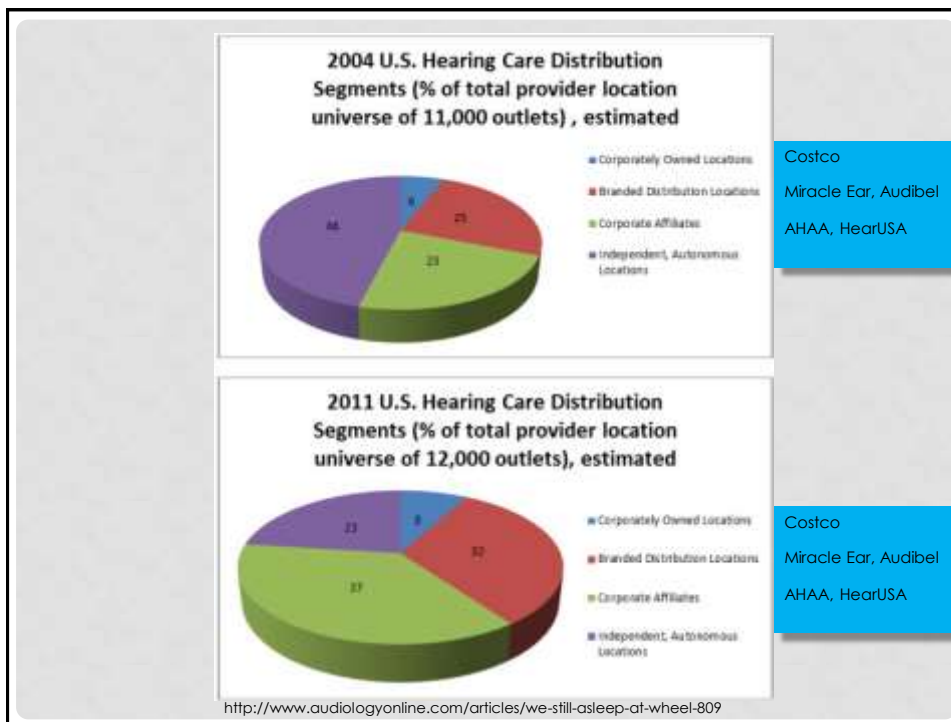
If you need to duplicate this poll make sure to copy/paste the entire slide (not just the place holder image).

RETAIL CHAINS

The Costco Wholesale logo, featuring the word "COSTCO" in a bold, red, sans-serif font with a registered trademark symbol, and the word "WHOLESALE" in a smaller, blue, sans-serif font below it, separated by three horizontal blue lines.

COSTCO
WHOLESALE





AUDIOLOGY RELINQUISHING ITS AUTONOMY?

Vestibular Assessment

1992*	1998*	2008**
51%	47%	37%

Vestibular Diagnosis/Interpretation

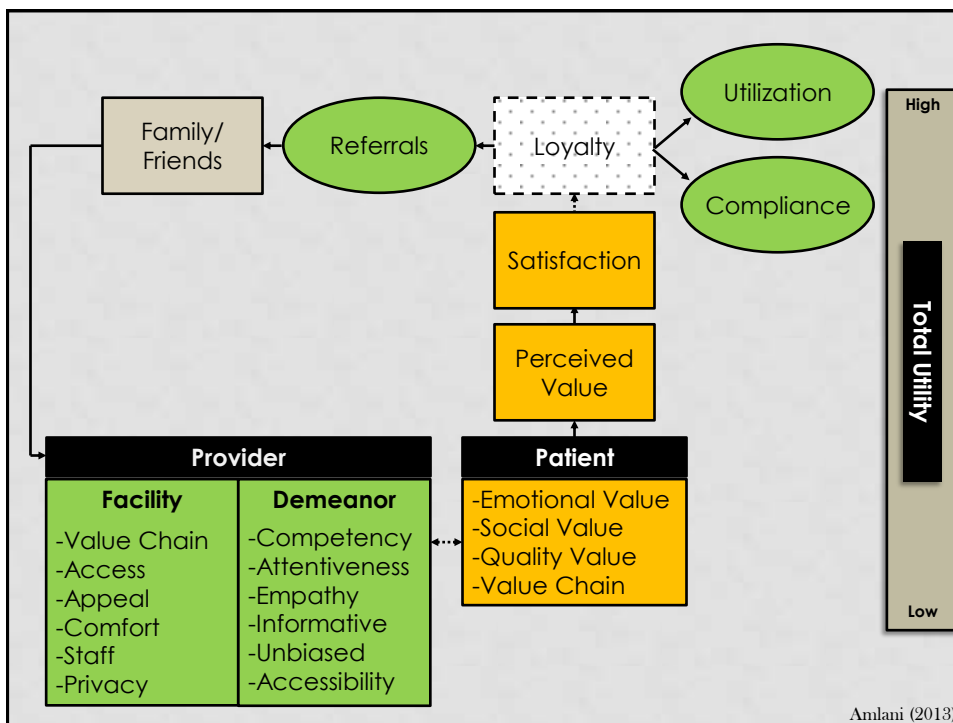
1992*	1998*	2008**
---	80%	56%

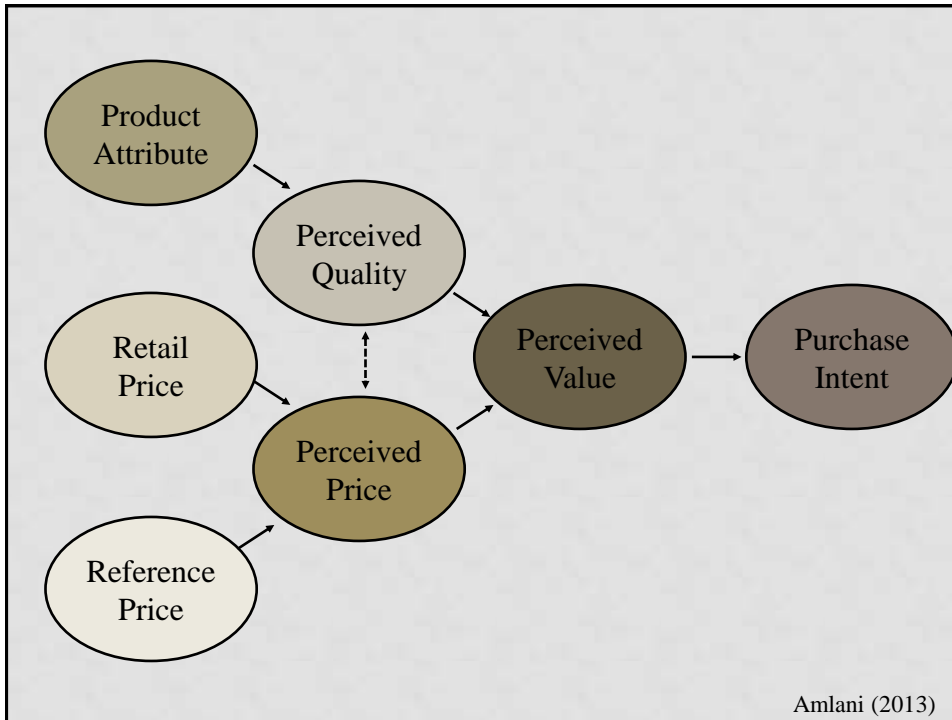
CAP Assessment

1992*	1998*	2009***
64%	---	37%

* Martin et al (1998); **ASHA (2012); Emmanuel (2009)

WHAT OPPORTUNITIES ARE
AVAILABLE FOR... GROWTH?
SUSTAINABILITY? AUTONOMY?





(MIS) UNDERSTANDING THE PATIENT

MISSED OPPORTUNITY - 1

PATIENT EXPECTATIONS

(AMLANI & D'ABREO, UNPUBLISHED)

- Pilot study (23 DFW Practices; 54 Patients)
 - Dispensers (AuD, HIS) expectations of hearing healthcare differ from those of patients

<ul style="list-style-type: none"> • Dispensers <ul style="list-style-type: none"> • Product-driven <ul style="list-style-type: none"> • Unwilling to assist if product is not purchased from that dispenser • Price • Physician Referrals • Advertising/Marketing • Device Brand 	<ul style="list-style-type: none"> • Patients <ul style="list-style-type: none"> • Service-driven (Counseling, Rehab) • Practice Reputation <ul style="list-style-type: none"> • Lack Knowledge of Degree Differences of Providers • Family/Friend Recomm. • Dispenser Competency • Payment Options
--	--

PATIENT EXPECTATIONS

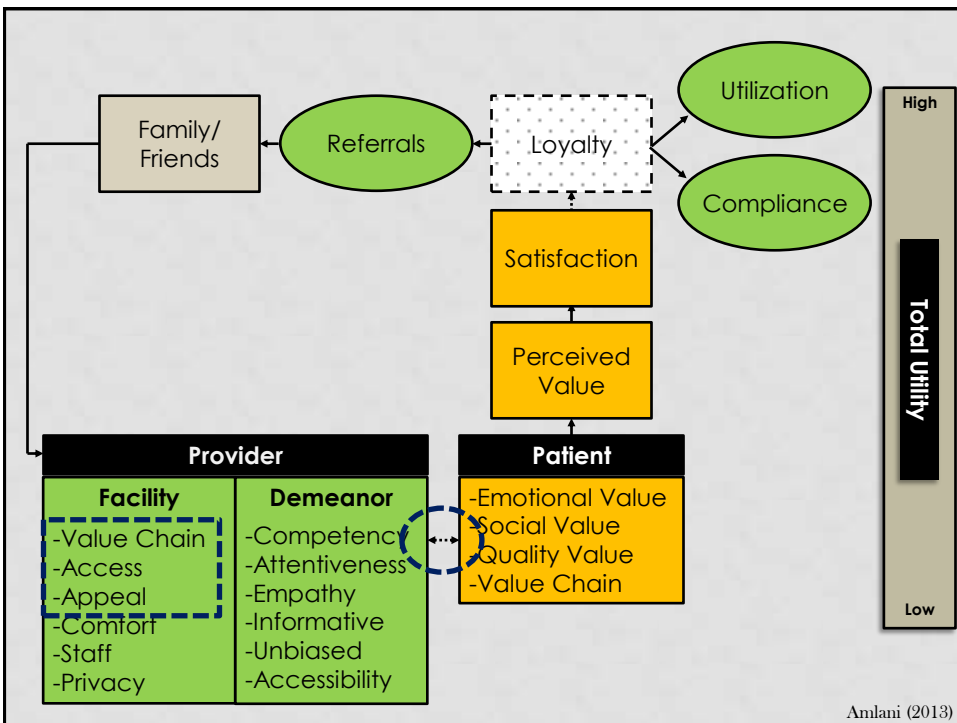
(AMLANI & D'ABREO, UNPUBLISHED)

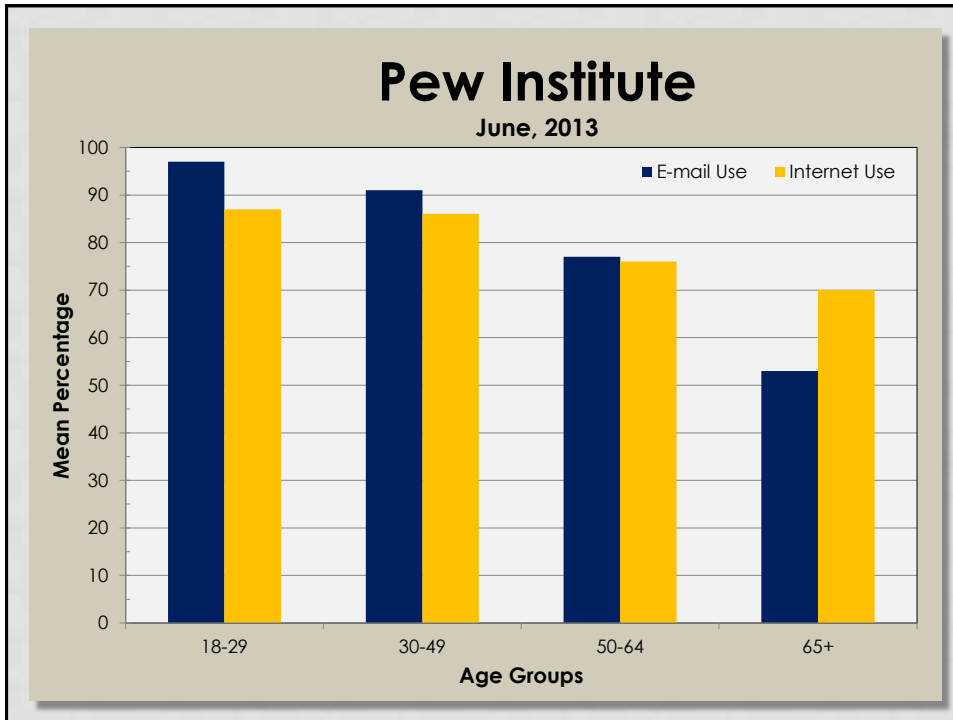
- Pilot study (23 DFW Practices; 54 Patients)
 - Dispensers (AuD, HIS) expectations of hearing healthcare differ from those of patients

<ul style="list-style-type: none"> • Dispensers <ul style="list-style-type: none"> • Assume that aided audibility benefits listening in all situations • Assume that experienced and inexperienced listeners have the same needs 	<ul style="list-style-type: none"> • Patients <ul style="list-style-type: none"> • Experience "significant" problems in at least >3 environments using the device • Experienced and inexperienced listeners have different needs
--	---

INTERNET PRESENCE

MISSED OPPORTUNITY - 2





THE JOINT

...the chiropractic place

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(214) 306-7761

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Includes: **Consultation, Exam and Adjustment**

- No Appointments
- Convenient Hours
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*This special introductory offer is available for new patients only.

Your Name:

Your Email Address:

Where are you now?

Get Your Introductory Offer

No other info given to anyone in order to receive an appointment.

Read what our amazing Patients have to say...
 What a great service! I had a really difficult finding and finally someone to take care of it. I was able to find relief only \$19.00 in the joint. I was right! The Doctor is caring and taking a 200 minute appointment. I strongly recommend it. Finally relief within 45 min. Great staff. Excellent location. Great atmosphere.

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Chiropractic Care for Neck, Head, & Shoulder Pain

Research Shows That Chiropractic is Safe

Chiropractic care is a safe, effective, and non-invasive approach to treating neck, head, and shoulder pain. Research shows that chiropractic care is safe and effective for a wide range of conditions, including neck pain, headaches, and shoulder pain. Chiropractic care is a natural, non-pharmaceutical approach to pain management that has been shown to be safe and effective for many years.

- Neck & Shoulder Pain
- Headaches
- Migraines
- Tension
- Vertigo
- Dizziness

Neck Pain Solutions

Chiropractic care can help relieve neck pain by adjusting the spine and improving blood flow to the neck muscles.

Shoulder Pain Relief

Chiropractic care can help relieve shoulder pain by adjusting the shoulder joint and improving range of motion.

Fix It Up Fast

Chiropractic care can help fix it up fast by adjusting the spine and improving overall health.

Lower Back Pain

Chiropractic care can help relieve lower back pain by adjusting the spine and improving posture.

Balance Your Body

Chiropractic care can help balance your body by adjusting the spine and improving overall health.

Headache Solutions

Chiropractic care can help relieve headaches by adjusting the spine and improving blood flow to the head.

2 Clinical Things You Should Know Before Choosing a Chiropractor

1. Look for a chiropractor who is a member of a professional organization, such as the International Chiropractors Association (ICA) or the American Chiropractic Association (ACA). 2. Ask to see the chiropractor's credentials and check their references.

14

Bloomberg Businessweek
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Making Money Through Your Company Website

June 12 | Bloomberg — Blue Frontier Media Founder and CEO Gabe Shaulian discusses monetizing web sites with Carl Messer on Bloomberg Television's "Taking Stock" | Source: Bloomberg

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SOCIAL MEDIA EXPOSURE



HEARING SCREENINGS

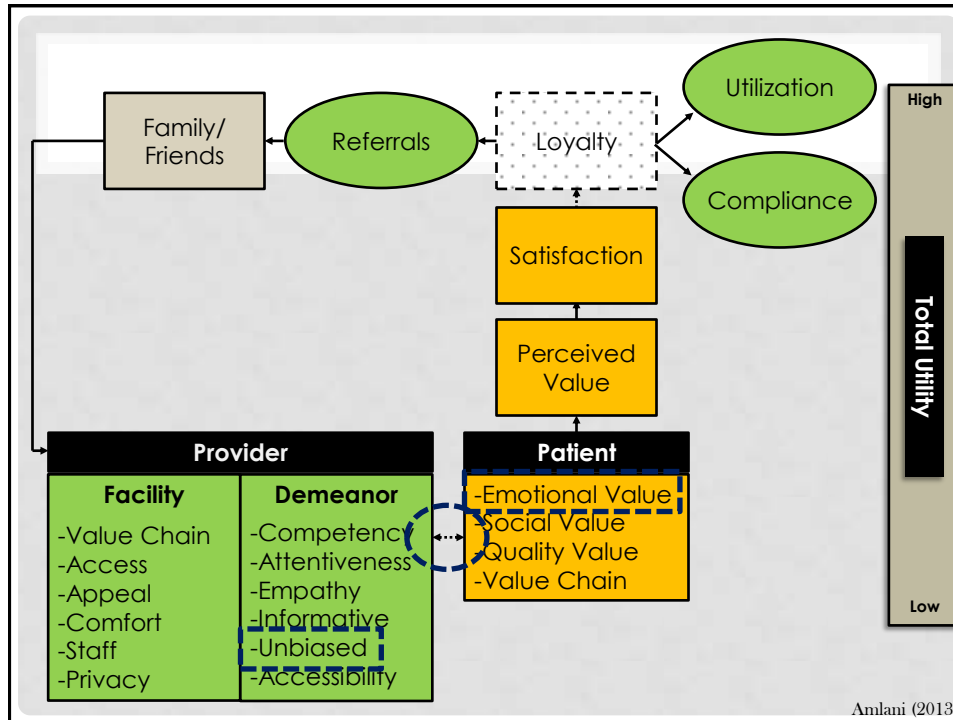
MISSED OPPORTUNITY - 3

HEARING SCREENING

- ~18% of face-to-face adult hearing screenings result in provider compliance and recommendations
 - Increase in denial for hearing loss
 - Increase in perceived pressure for hearing aids, **NOT** audiological services



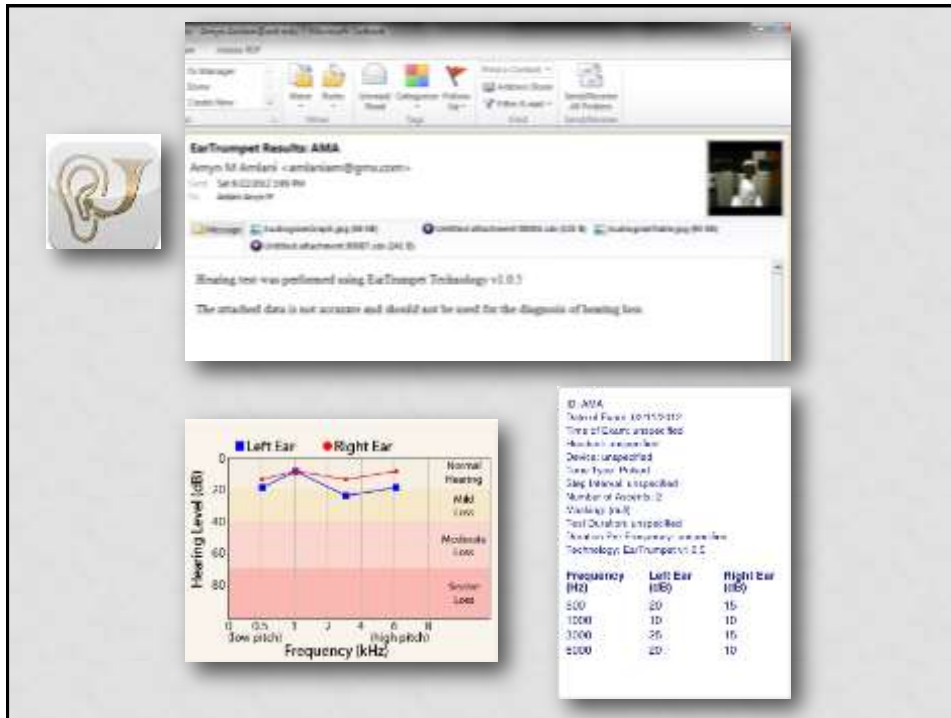
<http://www.e-district.org/sites/213/projects.php>



IMPROVING REFERRALS THROUGH SMARTPHONE HEARING SCREENINGS

(AMLANI & RUSSO, UNPUBLISHED)

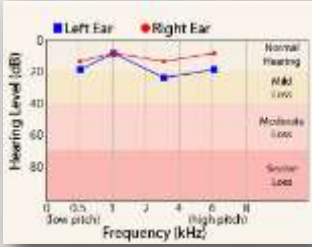
- Group 1 (n = 104)
 - Traditional hearing screening
 - Otoscopy, tympanometry
 - 20 dB at 1000, 2000, 4000 Hz
 - 30 dB at 500 Hz (based on behavioral testing)
 - Traditional counseling
- Group 2 (n = 104)
 - Smartphone Application on iPad 2 with Standard Apple Earbud Headphones
 - **No** counseling
 - Provided e-mail account for folks who wanted additional testing/counseling



EarTrumpet Results: AMA
 Amy M Amiani <amiani@gnu.com>
 Sent: 5/6/2012 2:59 PM
 To: amy@gnu.com

Attachments: [audiogramtest.jpg \(88 KB\)](#); [earshot attachment 2012-05-06 \(2.5 KB\)](#); [audiogramtest.jpg \(88 KB\)](#); [earshot attachment 2012-05-06 \(2.5 KB\)](#)

Hearing test was performed using EarTrumpet Technology v1.0.3
 The attached data is not accurate and should not be used for the diagnosis of hearing loss.



Summary:

ID: AMA
 Patient Name: 10/15/2012
 Time of Count unspecified
 Headset: unspecified
 Device: unspecified
 Tone Type: Mixed
 Clog: Internal, unspecified
 Number of Probes: 2
 Working: y/n/n
 Test Duration: unspecified
 Analysis For: Frequency analysis
 Technology: EarTrumpet v1.0.3

Frequency (Hz)	Left Ear (dB)	Right Ear (dB)
500	20	15
1000	10	10
3000	25	15
5000	20	10

IMPROVING REFERRALS THROUGH SMARTPHONE HEARING SCREENINGS (AMLANI & RUSSO, UNPUBLISHED)

- Results
 - Group 1
 - 16 listeners, out of 104, made appointments for diagnostic testing (i.e., 15.4%)
 - 11 had sufficient hearing loss that required amplification
 - Group 2
 - 31 listeners, out of 104, e-mailed their results and made appointments for diagnostic (i.e., 29.8%)
 - 21 listeners had sufficient hearing loss that required amplification
 - False positives in 6 listeners
 - Not a bad thing – opportunity to build relationship for the future

Odds of referral increase by 1.94 (i.e., 16/31) times using a smartphone compared to traditional methods

IMPROVING REFERRALS THROUGH SMARTPHONE HEARING SCREENINGS

(AMLANI & RUSSO, UNPUBLISHED)

- Results
 - Group 1
 - 11 candidates for amplification
 - 4 listeners underwent trial periods with amplification
- Group 2
 - 21 candidates for amplification
 - 15 listeners underwent trial periods with amplification

Closure Rate = 36%

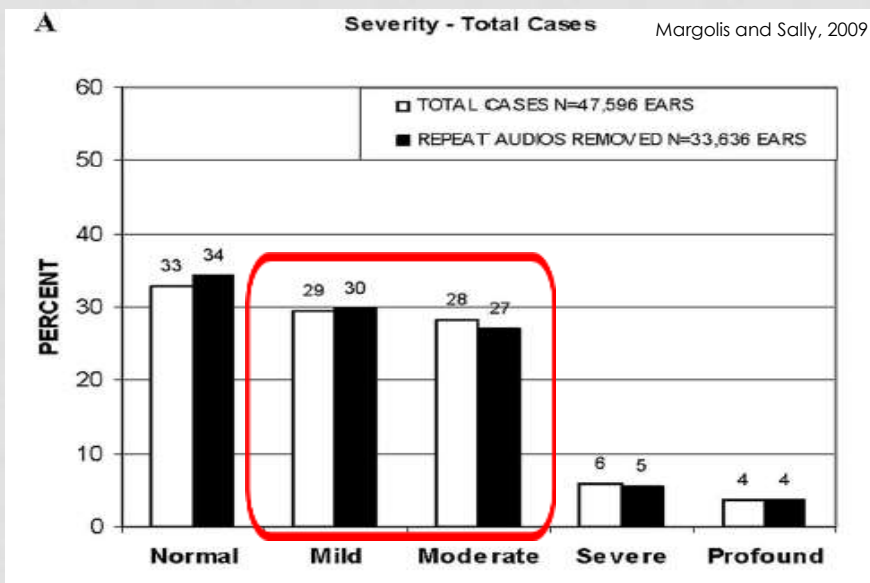
Closure Rate = 71%

Is it possible that smartphone applications increases self-acceptance of hearing loss and need for amplification?

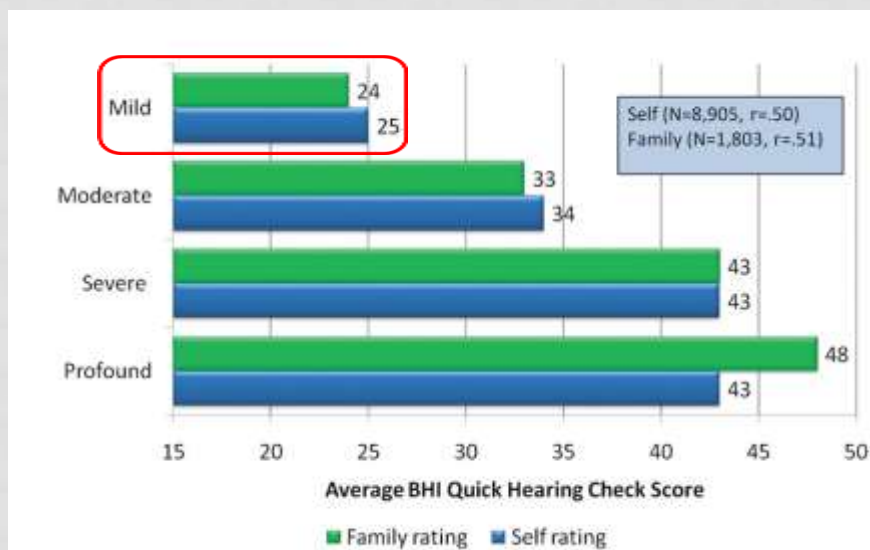
MILDER HEARING LOSSES

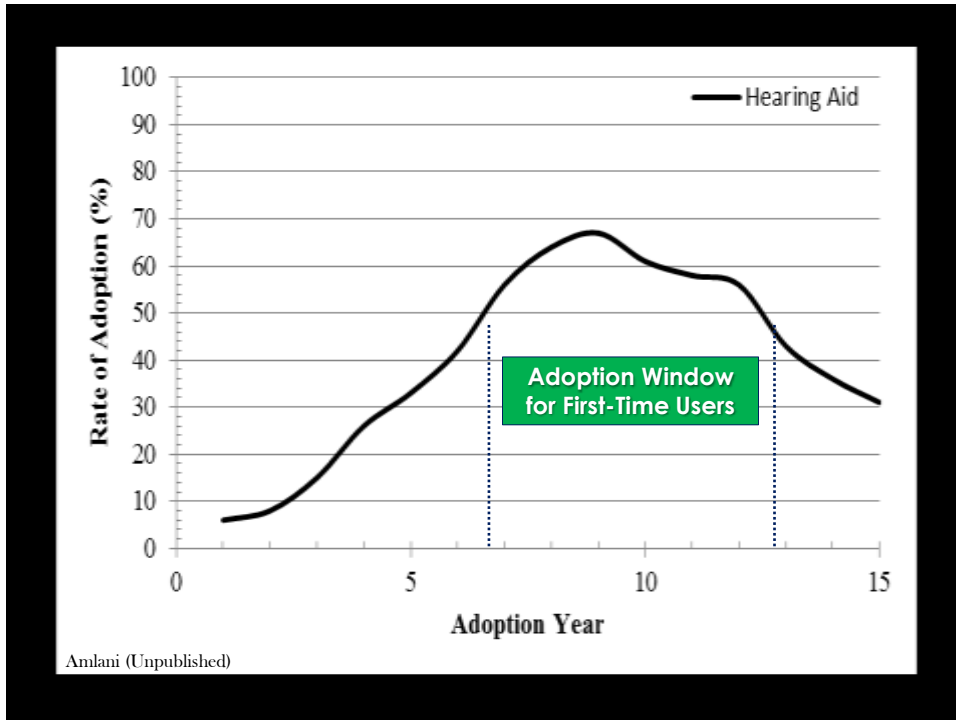
MISSED OPPORTUNITY - 4

LOST OPPORTUNITIES IN A TYPICAL PRACTICE?



LOST OPPORTUNITIES IN A TYPICAL PRACTICE?





REDUCE COGNITIVE DECLINE

Listen up: Dementia linked to hearing loss

Janice Lloyd, USA TODAY 6:07p.m. EST January 21, 2013



(Photo: SenereStock)

Millions of hearing-impaired older adults are more likely to suffer early memory and thinking problems than adults without hearing loss, a study out Monday finds.

Cognitive problems developed 30% to 40% faster when hearing declined to 25 decibels — mild hearing loss, according to the research online in the JAMA Internal Medicine. "That's when you begin noticing trouble hearing and understanding in settings like a busy restaurant," says lead author Frank Lin.



JANICE LLOYD

Janice Lloyd, who writes about aging and health.

Waiting time and “price elasticity”

A multiple regression study of the demand for gasoline at individual Boston-area service stations found that the elasticity of demand with respect to the price of gasoline was -3.3 .

Customers of service stations, however, pay two prices: one in money to the seller and another in the form of waiting time. Estimates of demand must take into account the customers' sensitivity to waiting. If a station raises its price by 1%, its customers must pay 1% more in money. But this tends to reduce customer purchases. Given the station's fueling capacity, the reduction in purchases will reduce waiting times, which tends to increase the quantity demanded.

Accordingly, the estimated “price elasticity” of -3.3 combines the responsiveness to an increase in price alone together with the responsiveness to a reduction in waiting time. After adjusting for the effect on waiting time, Png and Reitman estimated that the pure own-price elasticity ranged between -6.3 and -8.4 .

Other businesses that serve randomly arriving customers from a fixed capacity include Internet service providers, banks, hospitals, and supermarkets. In estimating the own-price elasticity of demand at any such business, an analyst must take care to adjust for the effect of price changes on waiting times.

Source: I. P. L. Png and David Reitman, “Service Time Competition,” *RAND Journal of Economics* 25, no. 4 (Winter, 1994), pp. 619–34.

SUBSTITUTE PRODUCT

(AMLANI ET AL, IN REVIEW)



~



QUESTION 2

- **Are smartphone hearing aid applications a threat to your business?**

A. Yes

B. No

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Enter slide show mode (F5) to view your live poll.

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FDA REGULATIONS

3. Personal Sound Amplification Products (PSAPs)

PSAPs are intended to amplify environmental sound for non-hearing impaired consumers. They are not intended to compensate for hearing impairment. Examples of situations in which PSAPs typically are used include hunting (listening for prey), bird watching, listening to lectures with a distant speaker, and listening to soft sounds that would be difficult for normal hearing individuals to hear (e.g., distant conversations,

performances). Because PSAPs are not intended to diagnose, treat, cure or mitigate disease and do not alter the structure or function of the body, they are not devices as defined in the Food, Drug and Cosmetic Act. As such, there is no regulatory classification, product code, or definition for these products. Furthermore, there are no requirements for registration of manufacturers and listing of these products with FDA.

However, PSAPs are subject to applicable provisions of the Radiation Control for Health and Safety Act of 1968, under which FDA regulates electronic products that emit sonic vibrations, such as sound amplification equipment. (See also 21 CFR 1000.15.) Manufacturers of PSAPs must report defects and adverse events and take other measures described in 21 CFR Part 1003. Manufacturers of PSAPs must also comply with the requirements to repurchase, repair, or replace electronic products required under 21 CFR Part 1004.

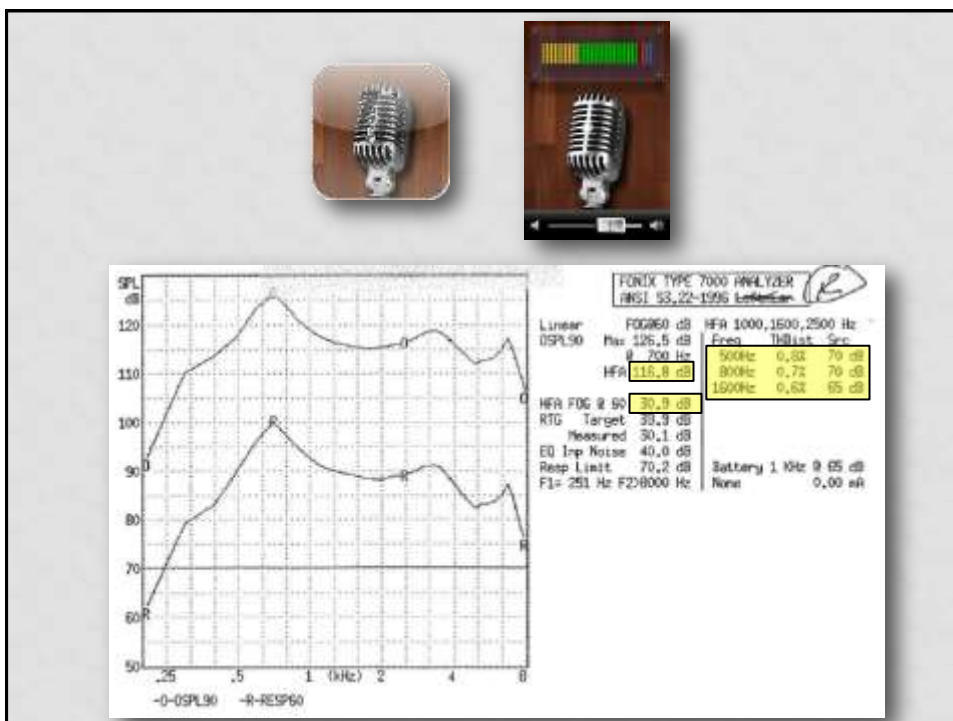
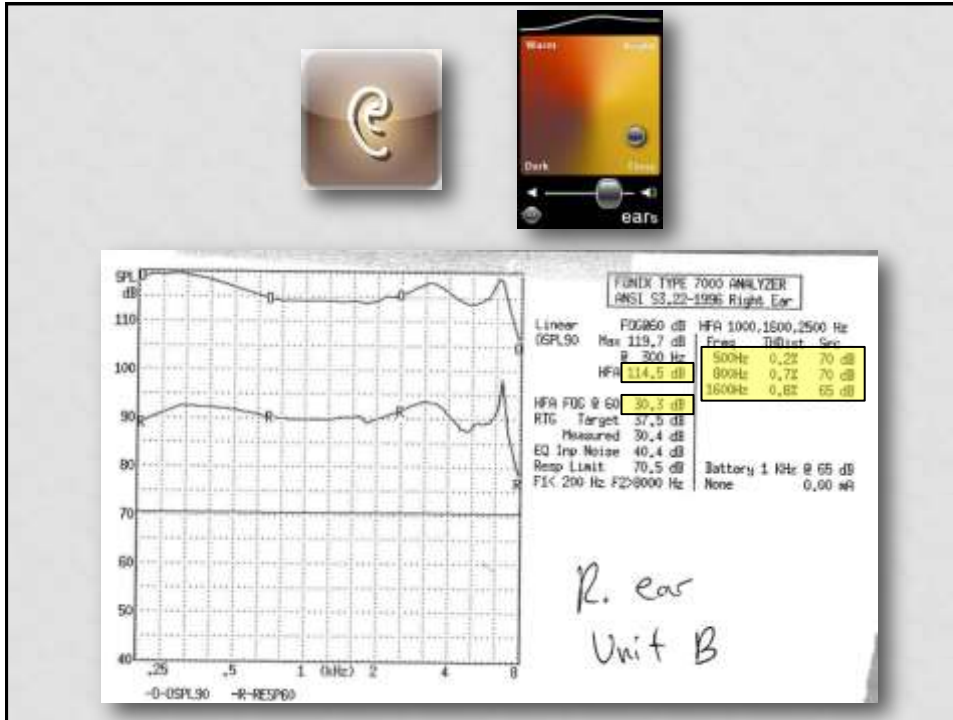
For questions regarding the requirements for PSAPs, please contact the Branch Chief for the Electronic Products Branch at 240-276-3291.

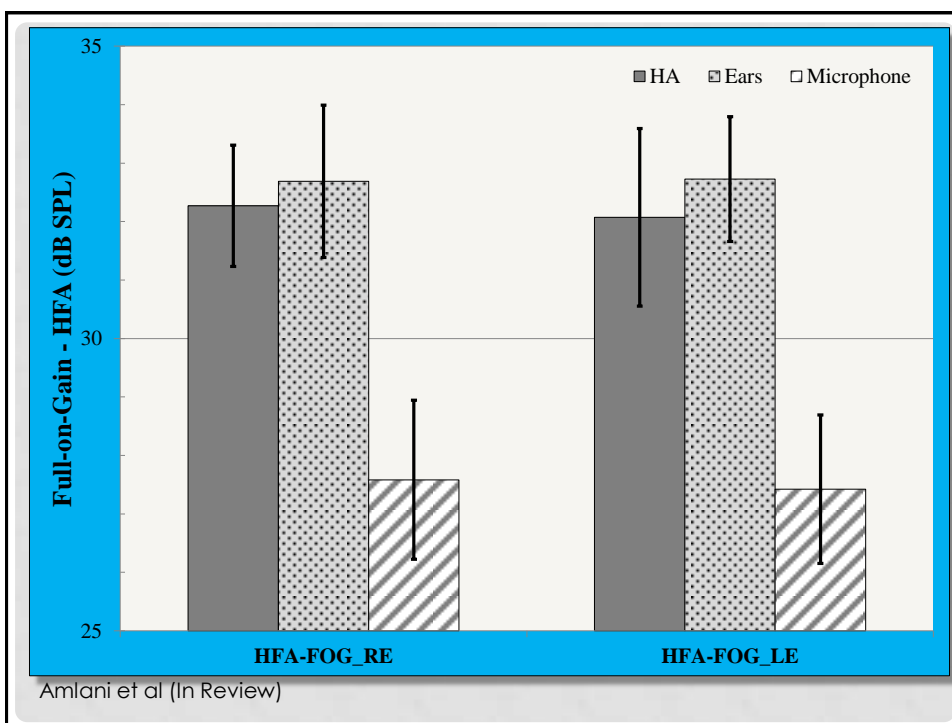
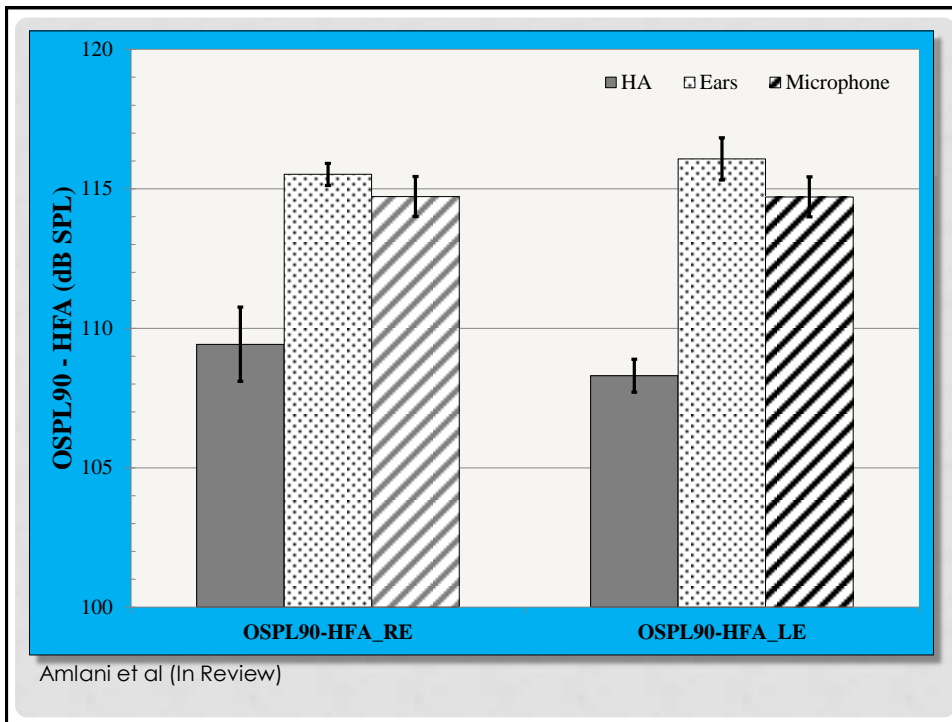
<http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm127086.htm>

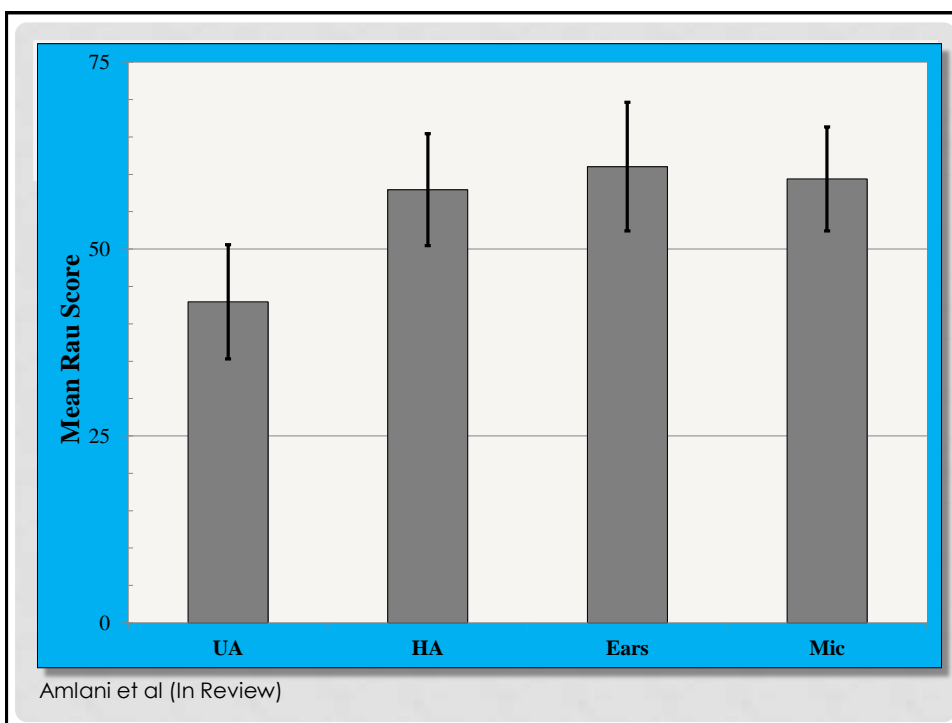
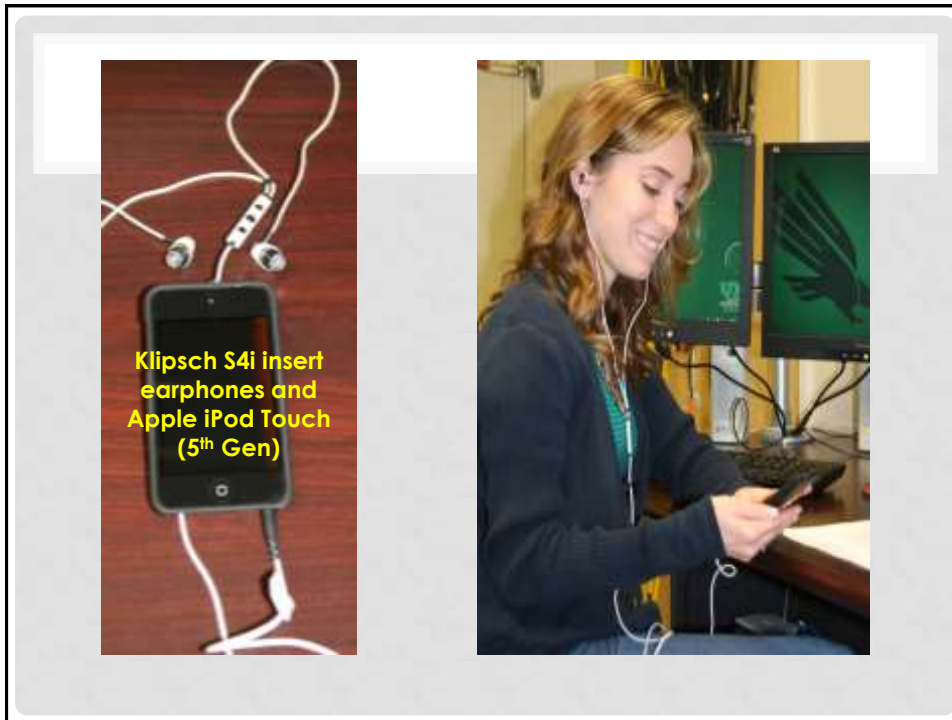
UNITRON SHINE+ MOD II 312 BTE SLIM TUBE

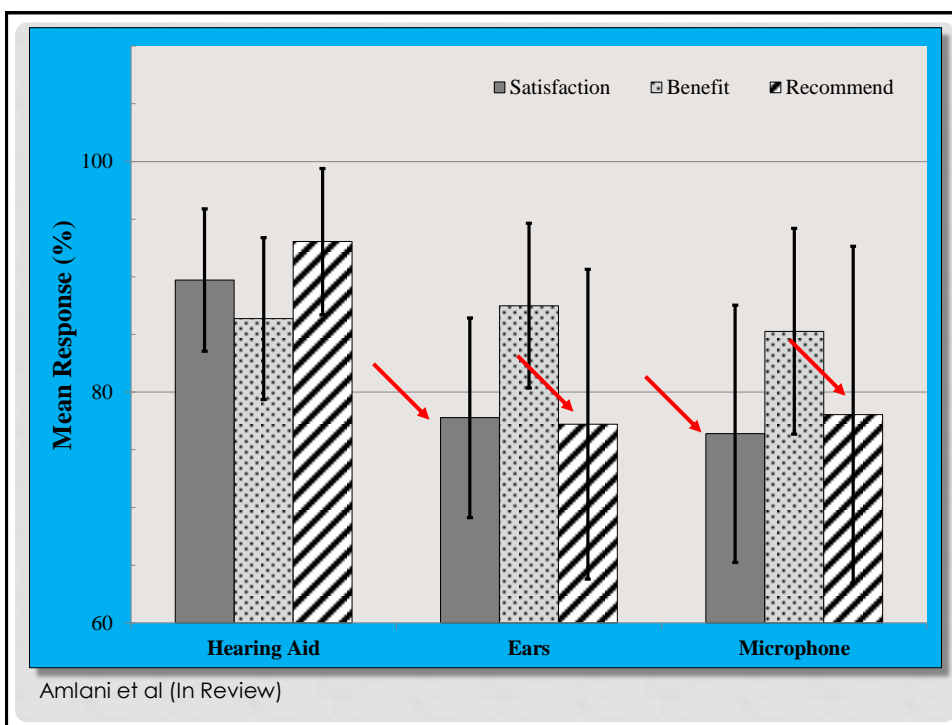
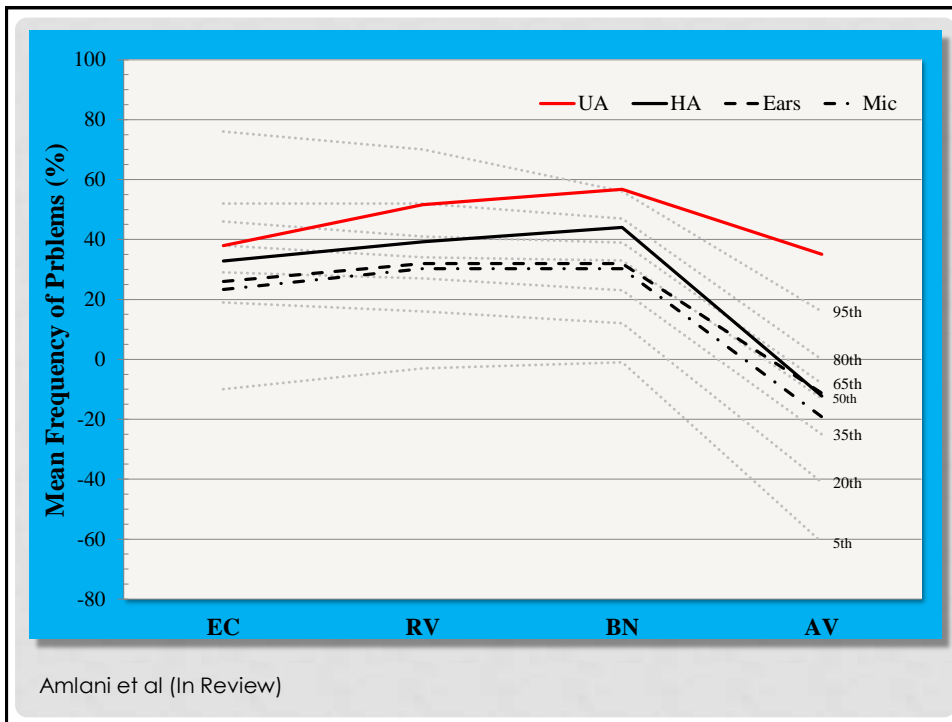


Shine+ Mod II		
ANSI 3.22 1996/ANSI 3.22 2003/IEC 118-7 2CC COUPLER TECHNICAL DATA		
Reference Test Frequency ANSI IEC 118-7	HFA 1.6 kHz	
OSPL ₉₀ Maximum HFA at RTF	117 dB 109 dB 104 dB	
Full on Gain (input 50 dB) Maximum HFA at RTF	45 dB 35 dB 33 dB	
Basic Frequency Response Frequency Range (Hz) Reference Test Gain (ANSI 1996/ANSI 2003)	< 100-7800 32 dB	





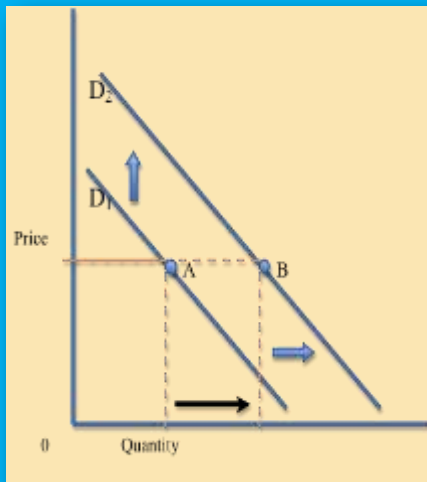




ADVANTAGES OF SMARTPHONE HEARING AID APPLICATIONS

- Allow relationship to be built between patient and practitioner
- Increase revenue stream by providing out-of-pocket services
 - These services separate audiology from
 - Dispensers/Otolaryngologists
 - "Big-Box" Retailers
- Improve acclimatization
- Reduce cognitive decline
- And...

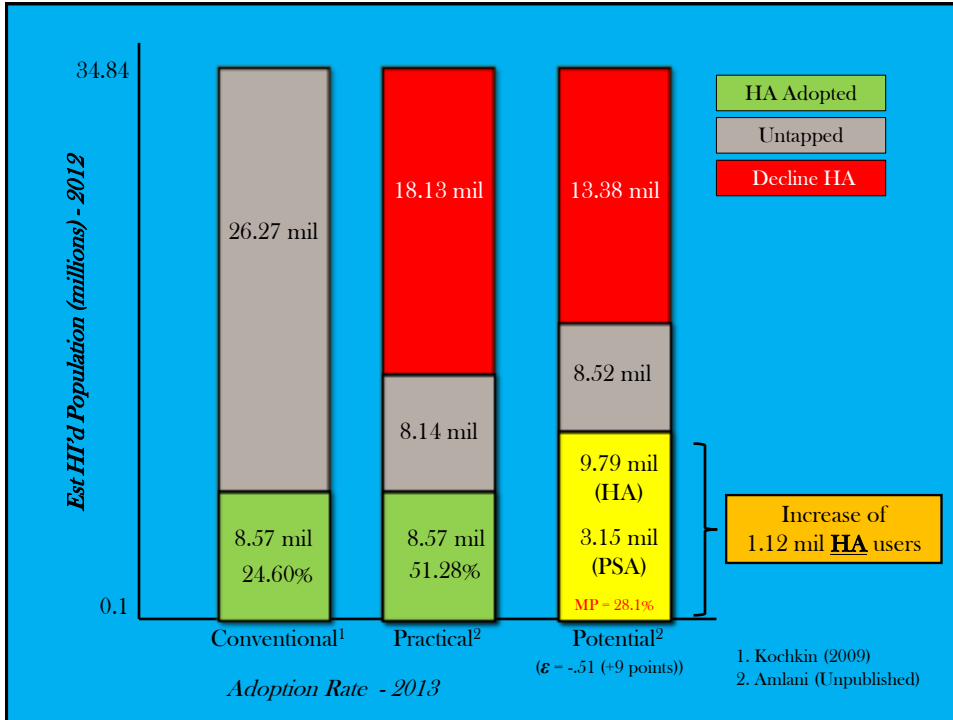
Improve ϵ = Increase Adoption Rates



Substitutes: By far the most important generalization to make about the determinants of demand elasticity is that the more and the better substitutes there are for a commodity, the higher the elasticity of demand will be.

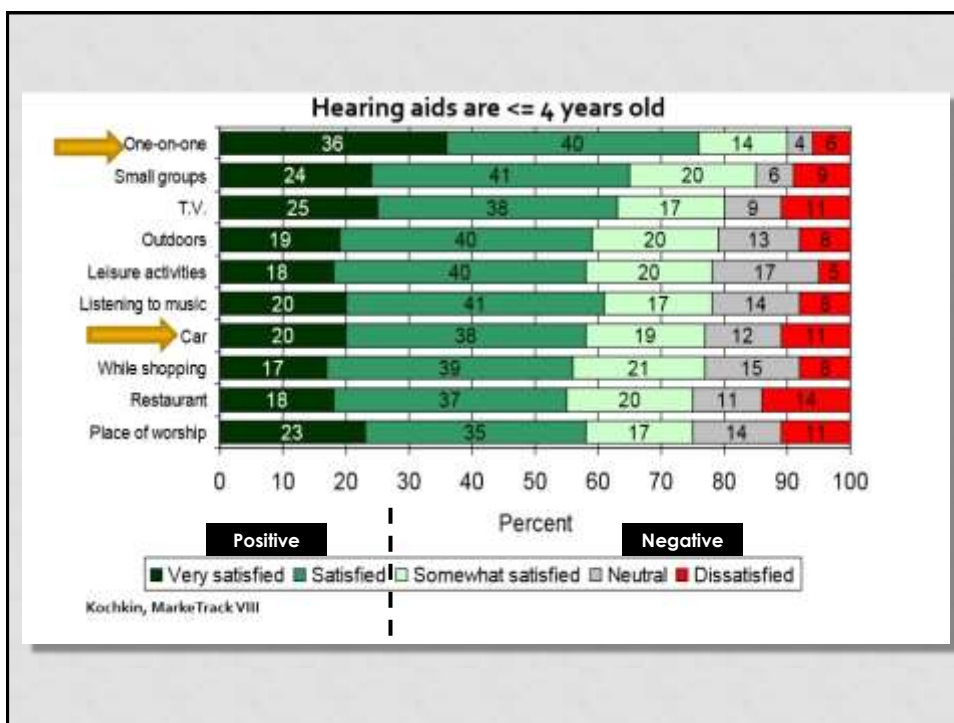
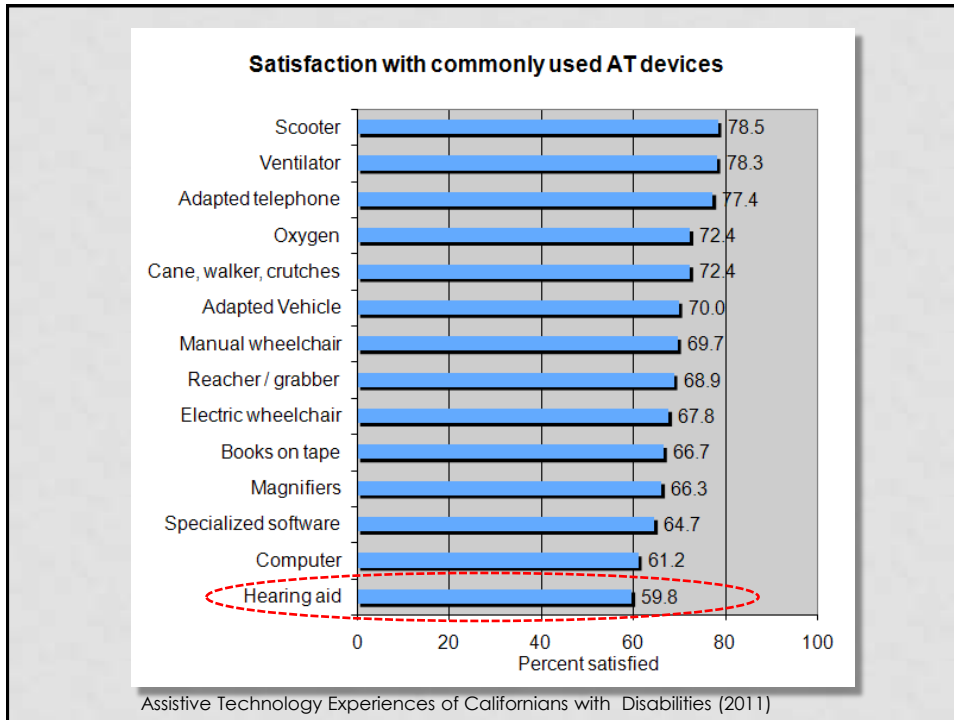
Lipsey & Harbury (2004) *Microeconomics (2nd Edition)*

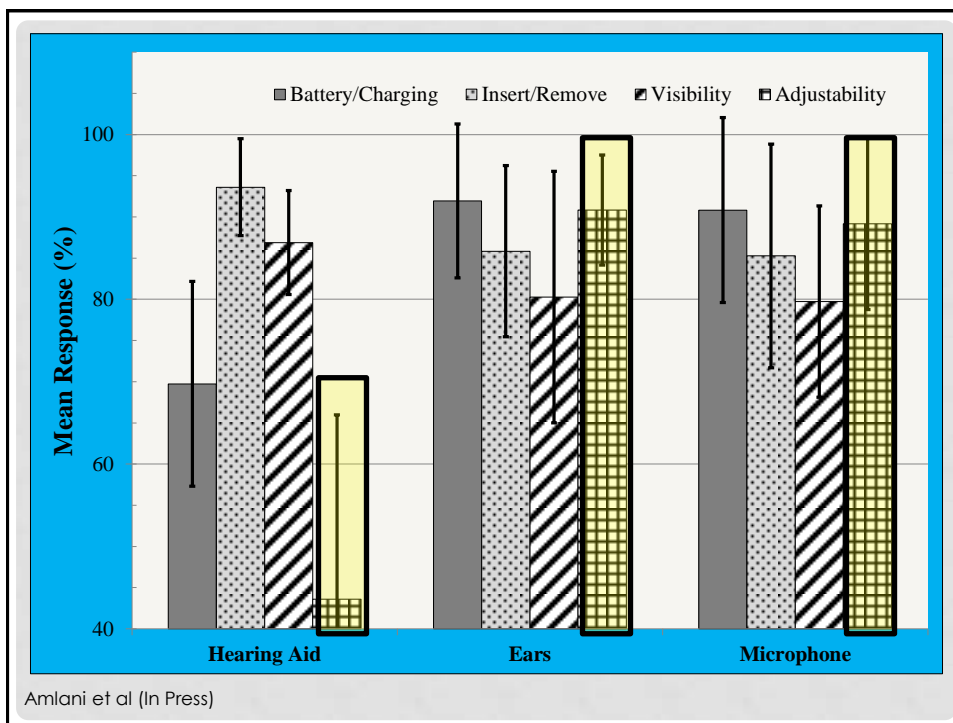
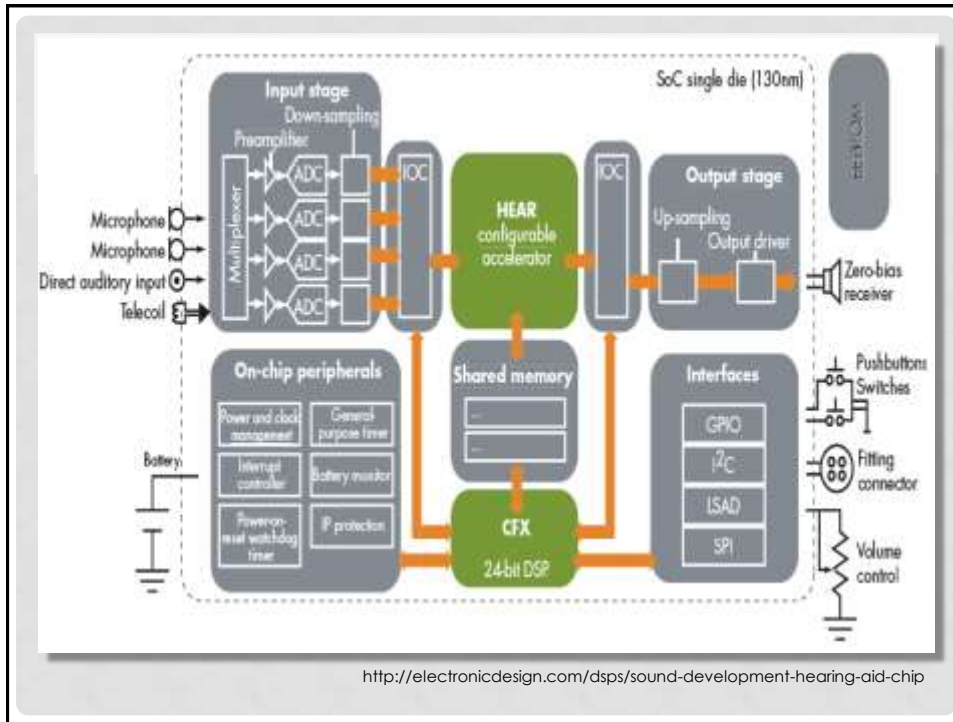
<http://12milebr.wordpress.com/2010/09/>



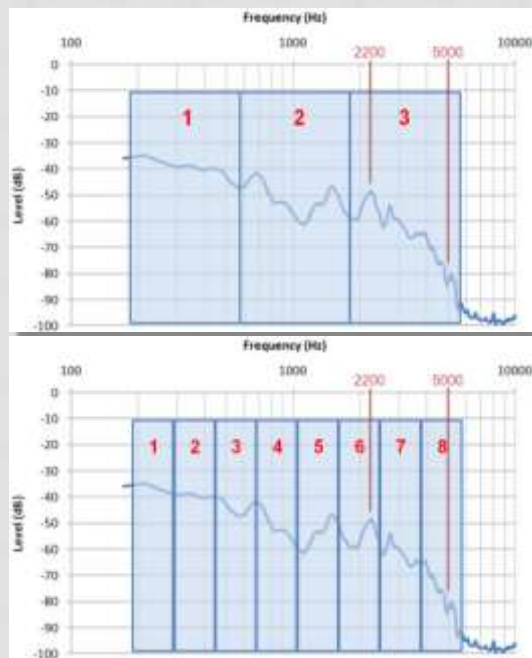
QUALITY OF DEVICE

MISSED OPPORTUNITY - 5

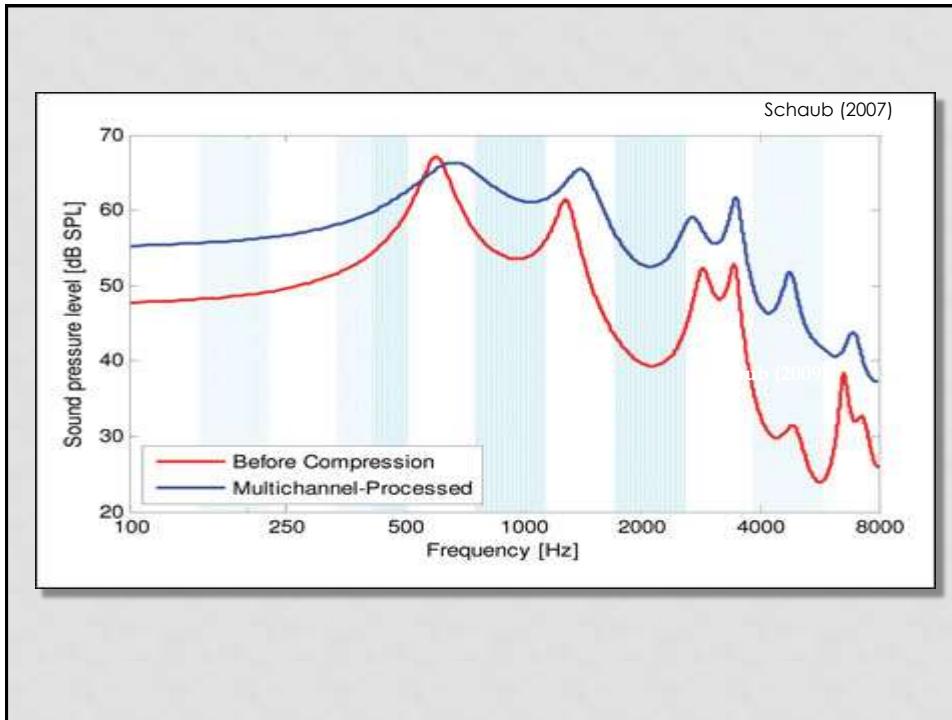




QUALITY OF DEVICE AND COGNITION



Galster & Galster (2011)




RETAIL PRICING DEPENDENT ON CHANNELS

	Audeo Q (Q90)	Audeo Q (Q70)	Audeo Q (Q50)	Audeo Q (Q30)
Channels	20	16	12	8

Home > Researching > Phonak > Audeo Q

[Pricing & Features](#)
[Technical Details](#)
[Accessories](#)

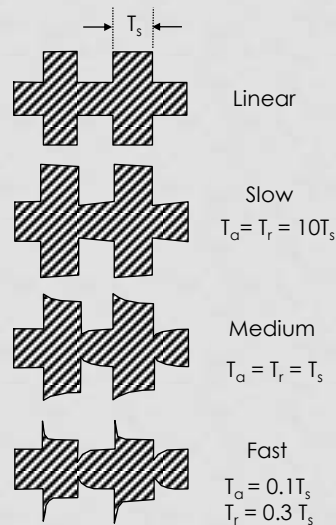

Phonak Audeo Q
[Add to Comparisons](#)

Q 30 : \$1,599.00 or \$44/mo. *
 Q 50 : \$1,899.00 or \$53/mo. *
 Q 70 : \$2,299.00 or \$64/mo. *
 Q 90 : \$2,799.00 or \$78/mo. *

- Price Per Fitted Ear, All Sizes
- Includes All Local Service

www.hearingplanet.com

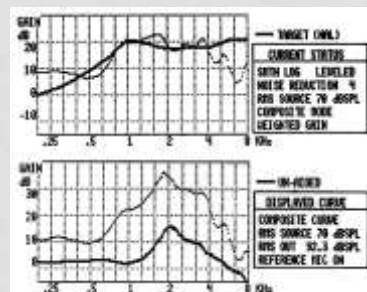
- Commercially available MCWDRC devices are often designed with fast-acting compression
- Some manufacturers' design hearing aids such that the attack (T_a) and release (T_r) times in all channels are symmetrical

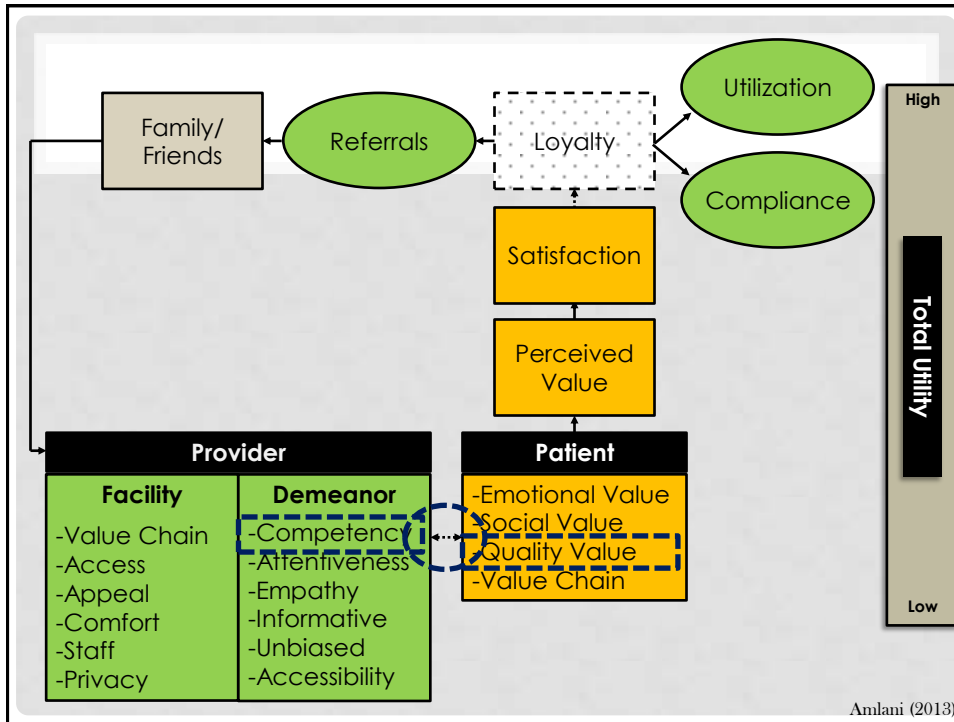


Dillon (2001)

INCREASE PERCEPTIONS BY PERFORMING...

- **Verification measures**
 - Real-ear
 - Speech Mapping
- **Validation measures**
 - Count-the-Dot Audiogram
 - Handicap/disability scales
 - Follow-up telephone call
- **Counseling/Rehabilitation**
 - Communication Strategies





PRICING

MISSED OPPORTUNITY – 6

QUESTION 3

- **Select a product below that you would purchase for the retail price of \$1.00.**

- A. Pencil
- B. Three-course meal at a five star restaurant
- C. Computer tablet

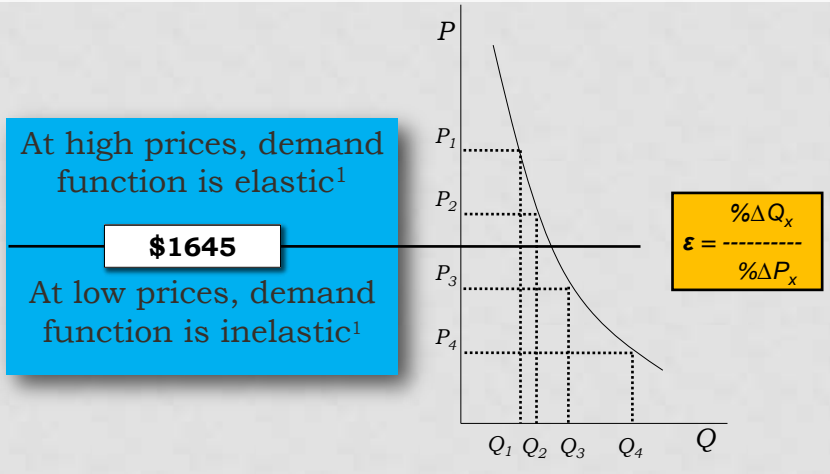
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ELASTICITY AND HEARING AID MARKET



1. Amlani & De Silva (2005); 2. Amlani (2010)

RELATIONSHIP – E AND TOTAL REVENUE

$$Total\ Revenue = \sum (Price_i \times Quantity_i)$$

Demand	Raise Prices	Reduce Prices
Elastic	Total Revenue Decreases	Total Revenue Increases
Inelastic	Total Revenue Increases	Total Revenue Decreases

Amlani (2008)

Caveat: Over-charging is not being advocated. Over-charging for a product or service can result in no gain or a loss in revenue.

Hypothetical Data – ABC Audiology, LLC
Data from Fiscal Year 2012-2013

Q	$\% \Delta Q$	P	$\% \Delta P$	ε	R
20		\$ 1,000.00			\$ 20,000.00
17	-0.16	\$ 1,700.00	0.52	-0.31	\$ 28,900.00
14	-0.19	\$ 2,500.00	0.38	-0.51	\$ 35,000.00
11	-0.24	\$ 3,300.00	0.28	-0.87	\$ 36,300.00
8	-0.32	\$ 4,000.00	0.19	-1.65	\$ 32,000.00
5	-0.46	\$ 4,800.00	0.18	-2.54	\$ 24,000.00
75					\$ 176,200.00

Forecast Scenario #1 – ABC Audiology, LLC
Reducing Price (-\$200) Across the Board

Q	$\% \Delta Q$	P	$\% \Delta P$	ε	R
21 (+1)		\$ 800.00			\$ 16,800.00
18 (+1)	-0.15	\$ 1,500.00	0.61	-0.25	\$ 27,000.00
15 (+1)	-0.18	\$ 2,300.00	0.42	-0.43	\$ 34,500.00
12 (+1)	-0.22	\$ 3,100.00	0.30	-0.75	\$ 37,200.00
9 (+1)	-0.29	\$ 3,800.00	0.20	-1.41	\$ 34,200.00
6 (+1)	-0.40	\$ 4,600.00	0.19	-2.10	\$ 27,600.00
81					\$ 177,300.00
					+\$1100.00

Forecast Scenario #2 – ABC Audiology, LLC
Increasing Price (+\$200) Across the Board

Q	$\% \Delta Q$	P	$\% \Delta P$	ϵ	R
19 (-1)		\$ 1,200.00			\$ 22,800.00
16 (-1)	-0.17	\$ 1,900.00	0.45	-0.38	\$ 30,400.00
13 (-1)	-0.21	\$ 2,700.00	0.35	-0.59	\$ 35,100.00
11 (-1)	-0.26	\$ 3,500.00	0.26	-1.01	\$ 35,000.00
7 (-1)	-0.35	\$ 4,200.00	0.18	-1.94	\$ 29,400.00
4 (-1)	-0.55	\$ 5,000.00	0.17	-3.14	\$ 20,000.00
69					\$ 172,700.00
					-\$3500.00

Forecast Scenario #3 – ABC Audiology, LLC
Following Revenue Table

Q	$\% \Delta Q$	P	$\% \Delta P$	ϵ	R
19 (-1)		\$ 1,200.00●			\$ 22,800.00
16 (-1)	-0.17	\$ 1,900.00●	0.45	-0.38	\$ 30,400.00
13 (-1)	-0.21	\$ 2,700.00●	0.35	-0.59	\$ 35,100.00
10 (-1)	-0.25	\$ 3,500.00●	0.26	-0.97	\$ 35,000.00
9 (+1)	-0.11	\$ 3,800.00◆	0.08	-1.28	\$ 34,200.00
6 (+1)	-0.40	\$ 4,600.00◆	0.19	-2.10	\$ 27,600.00
73					\$ 185,100.00
					+\$8900.00

● = Increase Price (+\$200) ◆ = Decrease Price (-\$200)



■ Research

Increasing Hearing Aid Adoption Rates Through Value-based Advertising and Price Unbundling

Explaining the benefits of our products and services is the key to future market growth

BY AMY M. AMLANI, PH.D., BRIAN TAYLOR, A.C.D., AND TARA WEINBERG

Feature	Pure Price Bundling	Partial Price Bundling	Price Unbundling
Hearing Aid	\$2200.00	\$2000.00	\$500.00
3 Memories	Included	Included	\$200.00
12 Channels, 8 Bands	Included	Included	\$200.00
Independent WDRC	Included	Included	\$200.00
Adaptive Directionality	Included	Included	\$250.00
Adaptive Noise Reduction	Included	Included	\$250.00
Adaptive Feedback Control	Included	Included	\$250.00
Professional Fee	Included	\$200.00	\$200.00
2-Year Mft Warranty	Included	Included	\$150.00
Total	\$2200.00	\$2200.00	\$2200.00

Amlani et al (2011)

QUESTION 4

- **Which pricing strategy is employed in your practice?**

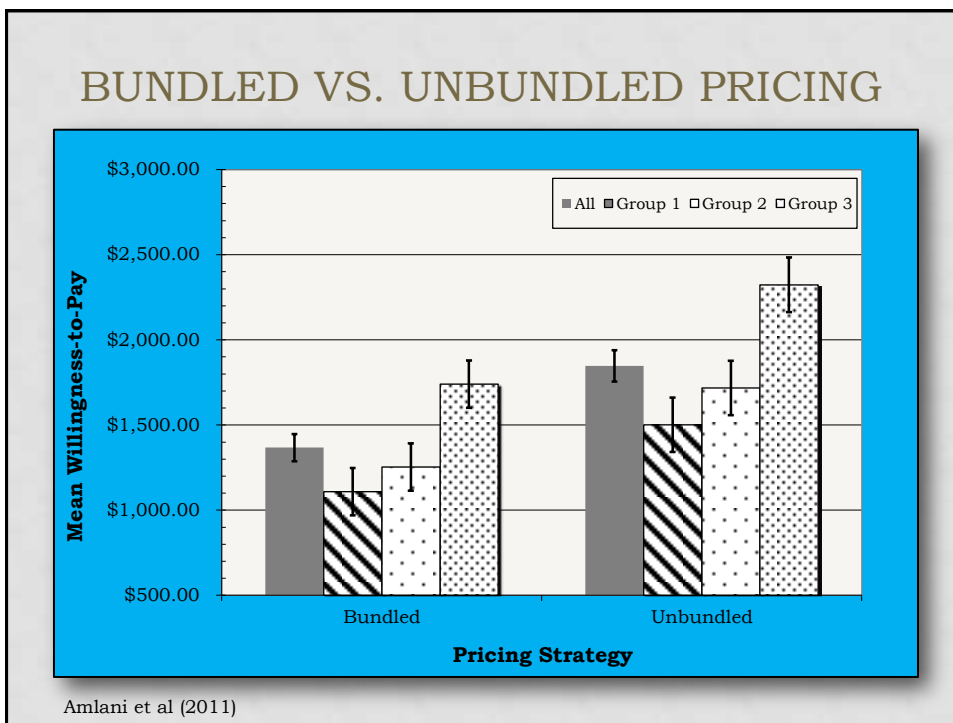
- A. Price Bundling
- B. Partial Price Unbundling
- C. Price Unbundling

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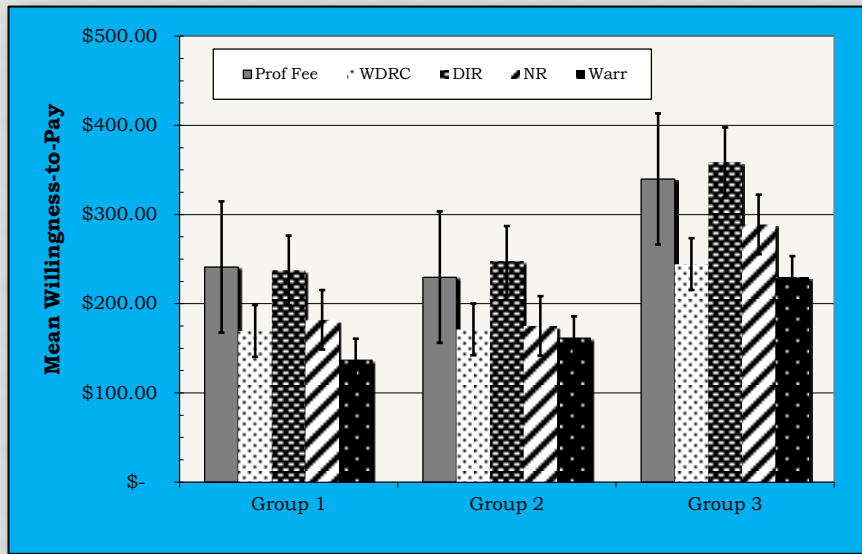
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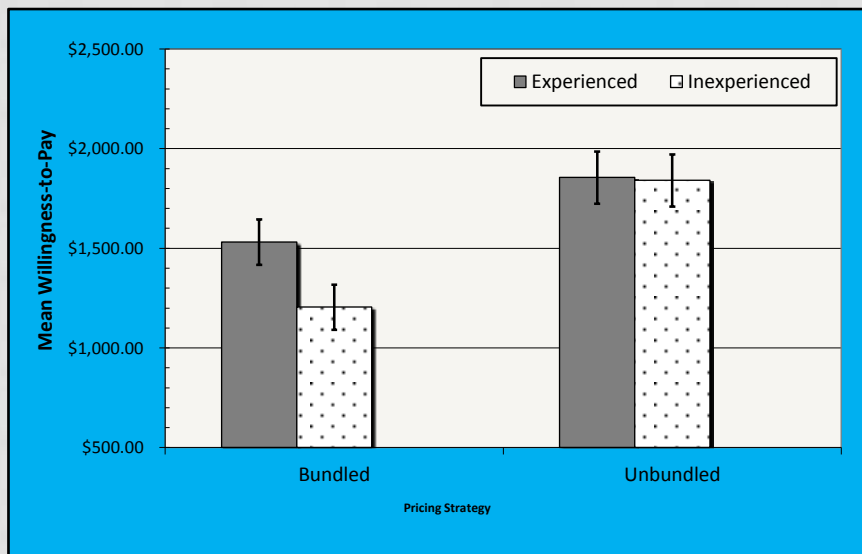


INFLUENCE OF ADVERTISING FRAMING

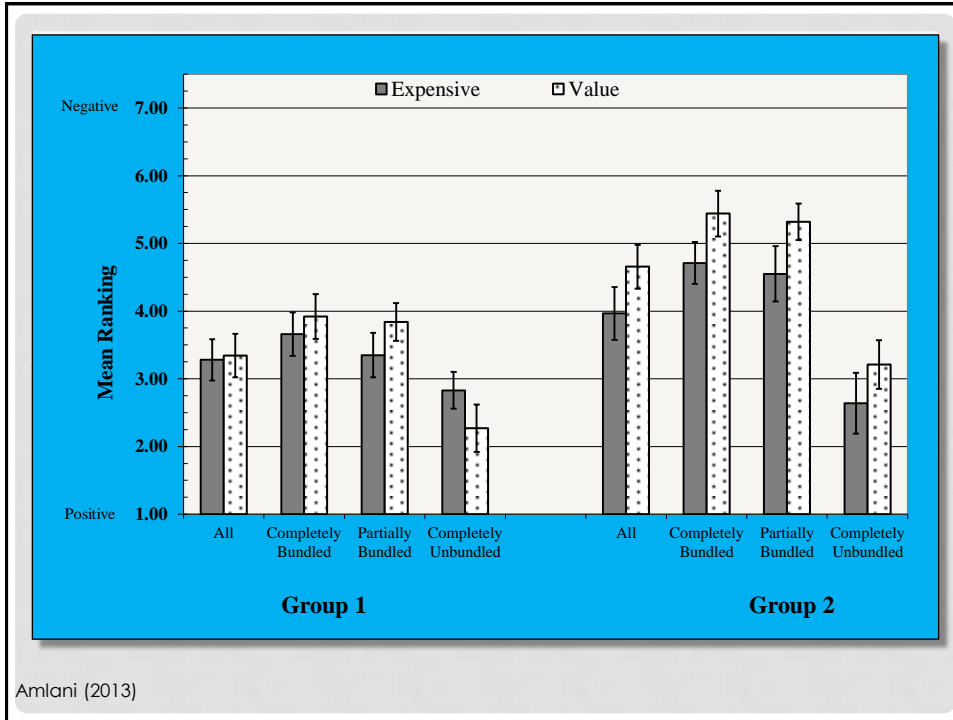


Amlani et al (2011)

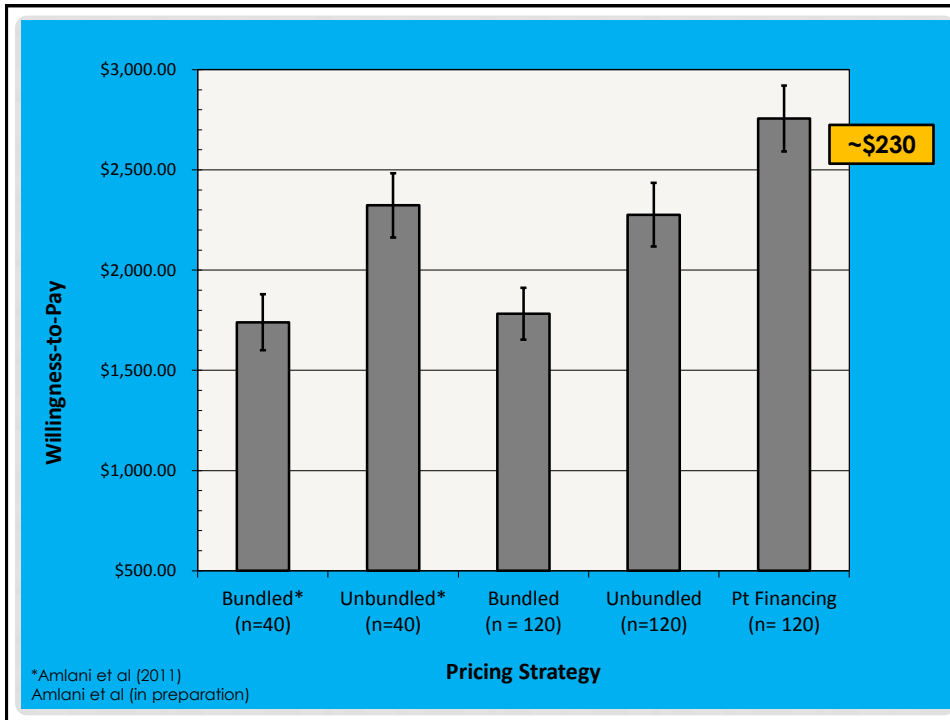
INFLUENCE OF PRICING STRATEGY



Amlani et al (2011)



SUBSTITUTE TO PRICE
UNBUNDLING



SUMMARY

