

Web Appendix for "Pricing Regulation and Imperfect Competition on the Massachusetts Health Insurance Exchange"

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A.1 Data Appendix

A.1.1 Insurance Price Data

A.1.1.1 Main Data

For November and December 2009, we used a Perl script to acquire price quotes from the Connector website in various age-zipcode-family size cells. We selected ten geographically distributed zipcodes in which to get a detailed set of price quotes.³⁰ In these selected zipcodes, we downloaded price quotes for each insurance plan for a single individual for each possible age under 65. (We also obtained family price quotes, but do not analyze them in this paper). Then, for every zipcode in Massachusetts, we downloaded price quotes for each plan for a 30 year old individual.

To build the full choice menu each individual faced, we then constructed estimated prices for all plans for all single individuals in November and December 2009. Using the estimated price quotes from the detailed zipcodes, we estimated the following model separately for each month. The price of plan j for age a in geographical region (market) m is given by

$$p_{ajm} = b_j + b_1 p_{30jm} + \sum_{s \in \{1, \dots, 7\}} \left(1_{a_{s-1}^* > a \geq a_s^*} \right) \cdot (b_{2s} + b_{3s} p_{30jm})$$

where $1_{a_{s-1}^* > a \geq a_s^*}$ is an indicator for whether the age for the price quote is in a given age category (between cutoffs a_{s-1}^* and a_s^*). This model which allows for a main effect of plan (b_j), age category (b_{2s}) and level of age-30 price, as well as interactions between age category and age-30 price (b_{3s}). The model has an R^2 of 0.978 on the detailed premium data. Taking the estimated coefficients from this model, we predict \hat{p}_{ajm} for all j, m, a where we have age 30-price quotes.

A.1.1.2 Robustness Checks

Our main analyses use only the November-December data, as we did not download any price quotes from the website prior to November 2009. However, for robustness checks and additional power for some reduced form analyses, we have explored extending the data back until July 2009. Based on the Connector transaction data, we determined that the set of plans j offered was constant between July 2009 and December 2009: no plans appeared or disappeared during this period. The Connector transaction data contains the list prices paid for the plans that individuals actually chose. On their own, these observations are not rich enough to construct the full menu of choices each individual faced. Nonetheless, we can

³⁰These zipcodes are 01020, 01240, 01604, 01824, 01923, 02124, 02130, 02360, 02459, 02474, 02601.

roughly approximate the plan prices that individuals faced between July 2009 and Oct 2009 using our Nov-Dec 2009 prices quotes. For each month t between July and October, we estimated the following equation based on the observed premiums paid by individual i for each plan (among new enrollees for each plan) and the November 2009 price of that plan as follows:

$$p_{i,ajmt} = b_0 + b_1 p_{ajm,Nov2009} + b_{insurer} + b_m$$

where $b_{insurer}$ and b_m are month-specific insurer and geographic region effects. We then use this model to predict the prices \hat{p}_{ajmt} of each plan in each cell. Because we estimate a geographic region fixed effect b_m , we exclude geographic regions that have fewer than 10 zipcodes from the July-Oct. choice menu construction (and hence from analyses using the July-Oct. data). Our results do not change when the consumer demand model is estimated on this expanded July-Dec. 2009 dataset.

A.1.2 Massachusetts HIE Transaction Data

We merged the insurance price quotes with our individual level transactions (an add record, cancel record, and payment records). Our main data sample (Nov.-Dec. 2009) focuses on people who enrolled in the exchange for the first time during this time ("add" transactions). We keep observations where the individual is 27-64 years old (inclusive), and who chose individual (not family) plans.

A.2 Reduced-Form Evidence on Response to Price

This section examines how total spending on health insurance responds to a price index, using a reduced form model. One way to summarize the response to price is the insurance spending elasticity, which relates total premiums paid to an index of the list prices individuals face. We summarize the effect of a price change on insurance spending using the following model:

$$\ln y_i = \eta \ln (p_i) + \gamma \omega_i,$$

where y_i is the total insurance premiums paid by individual i (given the actual prices), p_i is a price index for a representative bundle of plans, and ω_i is a vector of individual characteristics. The insurance spending elasticity is given by η and says that if the price index rises by 1%, the total spending rises by $\eta\%$.³¹ If $\eta < 1$, individuals respond to higher prices by reducing their spending on insurance, while if choice of insurance plan stayed the same, then $\eta = 1$.

In this context, the percentage price increase at each threshold varies among plans and insurers.³² We therefore create a price index, in which each plan is assigned a weight. Because the plan menu varies by geographic region, we create geographic-specific weights: a plan's

³¹Of course, while identifying η is a valuable way of summarizing the data that can facilitate out-of-context prediction, individuals do not in fact face a continuous choice of dollars spent on health insurance; the discrete choice individuals actually face is modeled in Section 3.

³²By contrast, a change in tax deduction for employer-sponsored health insurance (as in Gruber and Washington 2005) would lead to the same percentage change in price for all the plans, eliminating the need to construct a price index.

weight is the fraction of people in a geographic region who chose that plan, averaged over July to December 2009.³³ Column 1 of Table A.1 shows how the price index jumps at each age threshold. It presents the results of the following regression:

$$\ln p_i = G(a) + \sum_{s \in \{1, \dots, 7\}} 1_{a \geq a_s^*} \pi_s + \gamma \omega_i, \quad (1)$$

where $G(a)$ is a linear spline in age and ω_i includes gender, month of enrollment, and indicators for geographic region.³⁴ The coefficients π_s multiply indicator variables for whether age is greater than or equal to each of the age thresholds (each value of a_s^*) used for pricing. Each value of π_s shows how the price index jumps at the threshold a_s^* : for instance, we see that the price index increases by 20.4 log points when an individual turns 50. The jumps in prices are relatively small at age 30 and 35 but are more substantial at older ages.³⁵

Next, we examine how total spending on premiums changes at each age threshold shown in Column 2 of Table A.1. It presents the results of the regression

$$\ln y_i = G(a) + \sum_{s \in \{1, \dots, 7\}} 1_{a \geq a_s^*} \kappa_s + \gamma \omega_i \quad (2)$$

where $G(a)$, ω_i , and the age category indicators are the same as in Equation 1. The values of κ_s from this regression show how spending on premiums jumps at each age discontinuity. Thus, we see spending on premiums jump 19.2 log points at age 55, controlling for linear age trends above and below 55, along with other variables.

Comparing the percentage increase in spending (κ_s in Column 2) to the percentage increase in the price index (π_s from Column 1), we see that the increase in spending is slightly less than the increase in prices for all age thresholds except age 55. The bottom panel of Table A.1 shows the results of an instrumental variable regression that instruments for price index by age-category, controlling for an age spline. (Linear age splines have knots at each age threshold. Additional controls include indicators for month, geographic region, and gender.) Column 1 is thus the first-stage of this IV regression, and the F-statistic for excluded instruments (age-discontinuities) is a substantial 2823. The resulting estimate of η is 0.962 (s.e. 0.176), indicating that a 10% increase in the price index leads to a 9.6% increase in total spending in this population - a relatively limited response by individuals.

This nonstructural approach shows that there is little response in individual choice to price increases: the increase in spending is approximately equal to the increase in prices. Yet Section 3 shows that these results do *not* imply that individuals are not sensitive to price. Rather, individuals are already gravitating to the least generous tier and cheapest plans available. Thus, despite the wide range of plan generousities available in the exchange,

³³To construct a reasonable price index, we exclude geographic regions that had fewer than 10 zipcodes, as well as geographic regions that had fewer than four insurers.

³⁴Because we know the pricing model, gender and the linear age spline do not predict prices; they are included for comparability with later regressions.

³⁵The measured increases in the price index at the age thresholds (and their relative magnitudes) vary depending on how the price index is constructed. We gave plans weights based on popularity in a geographical region. Ideally, we would assign age-group specific weights (to create a Laspeyres or Paasche index). However, the sparsity of the data makes this an unappealing route. The construction of the price index has no bearing on how we measure the change in spending at each threshold (but is relevant for estimating η).

individuals do not have much latitude to respond to a price increase. They are simply unable to substitute to cheaper plans. Thus, these results highlight the importance of context in determining the effect of policy changes (e.g., altering the tax exclusion for employer-provided health insurance) and motivate our structural model of consumer preferences in Section 3.

A.3 Appendix Figures and Tables

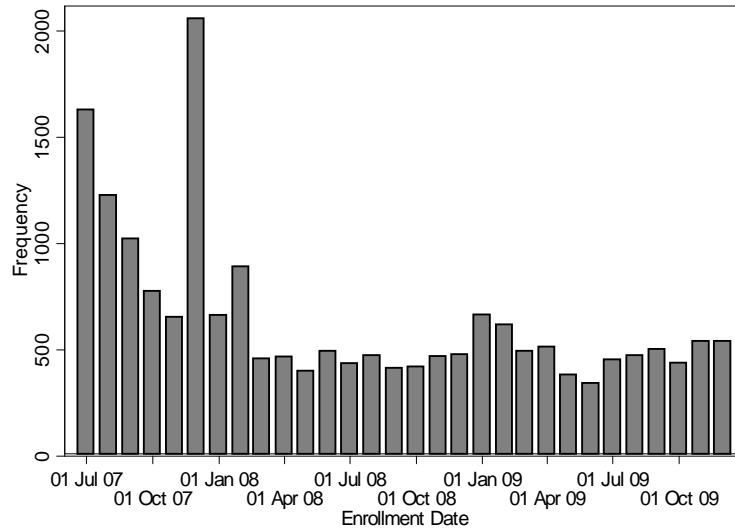


Figure A.1: Distribution of Initial Enrollment of Single Individuals.

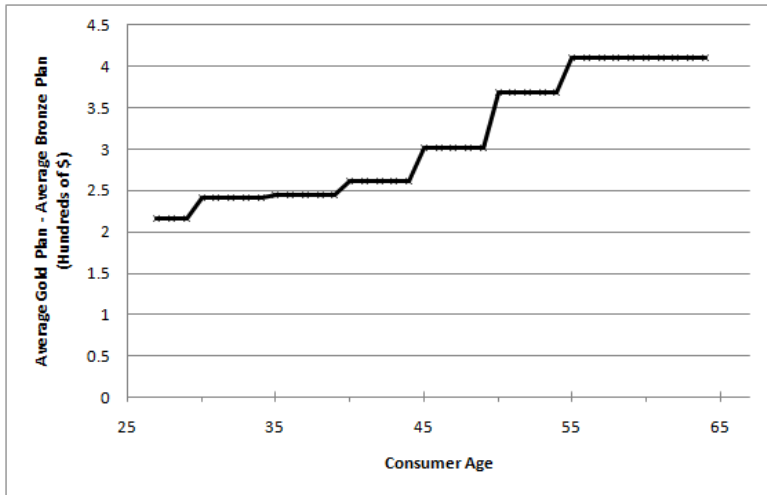


Figure A.2: Marginal Cost of Average Gold Plan versus Average Bronze Plan, By Age. Unit of observation is a plan-zipcode in Nov. 2009.

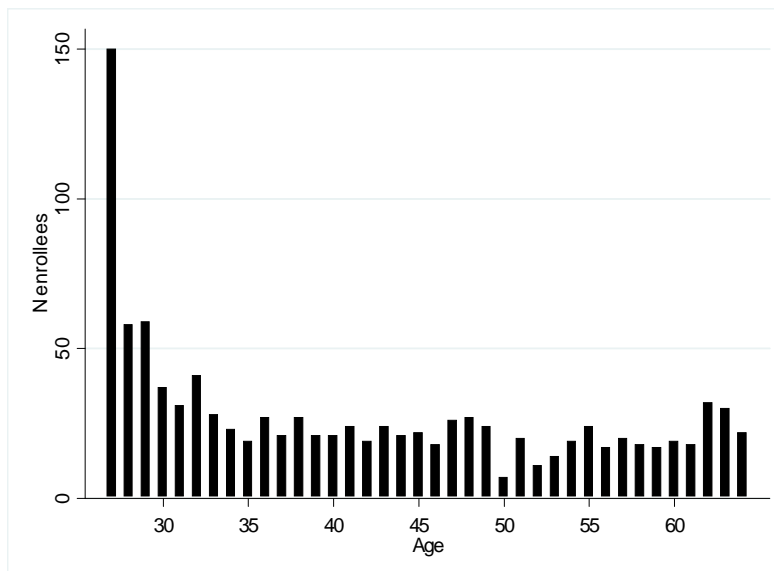


Figure A.3: Number of New Enrollees, By Age. Sample: Nov.-Dec 2009.

Table A.1: Price and Spending Response to Age Discontinuities

	ln(price index)	ln(premiums paid)
Indicators:		
Above 30	0.0224*** (0.00172)	-0.0438 (0.0323)
Above 35	0.0790*** (0.00199)	0.0442 (0.0411)
Above 40	0.150*** (0.00217)	0.147*** (0.0447)
Above 45	0.106*** (0.00189)	0.0138 (0.0440)
Above 50	0.204*** (0.00201)	0.207*** (0.0502)
Above 55	0.128*** (0.00232)	0.192*** (0.0462)
Linear Age Spline	Yes	Yes
Basic Controls	Yes	Yes
N Persons	2,616	2,616
R^2	0.998	0.572

IV-Stage 1 from Column 1

	ln(premiums paid)
ln(price index)	0.962 (0.176)
Linear Age Spline	Yes
Basic Controls	Yes
R^2	0.569

Sample: July-Dec. 2009 extended data sample. Note: Heteroskedasticity robust standard errors in parentheses. Age spline consists of piecewise linear age controls within each age group. Controls include indicators for month of enrollment, indicators for geographic market, and gender. IV results from two-stage least squares. *** p<0.01, ** p<0.05, * p<0.1.

Table A.2: Zipcode Characteristics of Enrollees By Age

	Unemployed	Fraction Married	White	Zip Code Income:		Count (in 1 year age bin)
				Mean	Median	
Omitted Category: Age 27-29						
Above 30	0.00295 (0.00318)	-0.00778 (0.0260)	-0.0411 (0.0291)	-2,739 (2,392)	-1,499 (3,992)	-9.107 (24.51)
Above 35	0.00387 (0.00402)	0.0157 (0.0246)	-0.0352 (0.0340)	-2,947 (2,620)	822.7 (3,722)	21.98 (18.89)
Above 40	-0.00753** (0.00323)	0.0319 (0.0253)	0.0265 (0.0272)	894.0 (2,280)	6,051 (4,039)	4.412 (6.624)
Above 45	0.00153 (0.00319)	-0.000514 (0.0242)	-0.0354 (0.0357)	-902.8 (2,307)	1,518 (4,006)	-8.676 (7.041)
Above 50	-0.00202 (0.00422)	-0.0150 (0.0257)	-0.0284 (0.0291)	-761.4 (2,471)	219.0 (4,483)	-26.29** (9.906)
Above 55	-0.00696** (0.00319)	0.0334 (0.0212)	0.0474* (0.0250)	3,730** (1,827)	6,887* (3,524)	-9.959 (8.320)
Age	-0.00544 (0.00675)	-0.0188 (0.0480)	0.00433 (0.0552)	2,252 (4,564)	-819.5 (8,011)	-90.25* (51.01)
Age ²	0.000118 (0.000154)	0.000417 (0.00109)	0.000118 (0.00127)	-34.93 (103.1)	13.87 (184.2)	1.847* (1.050)
Age ³	-7.90e-07 (1.10e-06)	-2.95e-06 (7.77e-06)	-1.81e-06 (9.10e-06)	0.147 (0.734)	-0.131 (1.326)	-0.0121* (0.00697)
Constant	0.105 (0.0933)	0.771 (0.667)	0.670 (0.759)	-10,126 (63,563)	70,991 (109,728)	1,433* (772.0)
Observations	1,052	1,052	1,052	1,052	1,052	38
R^2	0.019	0.050	0.032	0.007	0.012	0.767

Note: Heteroskedasticity robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Zipcode demographics are taken from the 2000 Census.

Table A.3: Price Sensitivity by Age in Conditional Logit Model, Bandwidth Checks

	27-34	30-39	36-44	40-49	46-54	50+
Premium (in \$100s)	-3.632*** (0.740)	-2.575*** (0.720)	-2.005*** (0.773)	-2.700*** (0.735)	-1.738** (0.767)	-1.375 (0)
Observations	2944	3098	2615	2575	2194	1701
Fixed Effects	Plan	Plan	Plan	Plan	Plan	Plan
	Tier*Age	Tier*Age	Tier*Age	Tier*Age	Tier*Age	Tier*Age
	Tier*Age ²	Tier*Age ²	Tier*Age ²	Tier*Age ²	Tier*Age ²	Tier*Age ²

Note: Heteroskedasticity robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Panels B and C include plan fixed effects, and tier effects interacted with age trends (both linear and quadratic terms).

Table A.4: Direct Purchase of Insurance in Mass. by Age, American Community Survey

Age Group	N Direct Purchase	Fraction of Sample	Fraction of sample, normalized by years in age bin
27-29*	47,432	0.09	0.030
30-34	67,502	0.13	0.026
35-39	66,054	0.13	0.025
40-44	75,878	0.15	0.029
45-49	77,910	0.15	0.030
50-54	69,576	0.13	0.027
55-59	60,652	0.12	0.023
60-64	54,823	0.11	0.021

Data taken from American Community Survey, 3-year estimates, 2008-2010, Massachusetts only. Direct purchase variable is "HINS2". *Note smaller bin size in first row.

Table A.5: Price Sensitivity by Age in Conditional Logit Model, Bronze Only

Panel A: Basic Conditional Logits (Full Sample)						
	(1)	(2)	(3)			
Premium	-0.313***	-1.719***	-1.749***			
(in \$100s)	(0.109)	(0.242)	(0.254)			
Premium*age		0.0271***	0.00312			
		(0.00419)	(0.00871)			
Fixed Effects	Plan	Plan	Plan, Plan*Age			
N Person*Plan	6,870	6,870	6,870			
Panel B: Conditional Logits by Age Group						
	27-34	30-39	36-44	40-49	46-54	50+
Premium	-4.517***	-4.428***	-2.172***	-1.990***	-1.832***	-1.402***
(in \$100s)	(0.662)	(0.841)	(0.697)	(0.627)	(0.626)	(0.326)
N Person*Plan	2803	1175	1145	1471	1235	1858
Fixed Effects	Plan	Plan	Plan	Plan	Plan	Plan
	Tier*Age	Tier*Age	Tier*Age	Tier*Age	Tier*Age	Tier*Age
	Tier*Age ²	Tier*Age ²	Tier*Age ²	Tier*Age ²	Tier*Age ²	Tier*Age ²
Panel C: Conditional Logits For Counterfactual Exercise						
	Under 45			Over 45		
Premium	-3.291***			-1.463***		
(in \$100s)	(0.464)			(0.205)		
Fixed Effects	Plan			Plan		
	Tier*Age			Tier*Age		
	Tier*Age ²			Tier*Age ²		
N Person*Plan	4248			6870		

Note: Heteroskedasticity robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Panels B and C include plan fixed effects, and tier effects interacted with age trends (both linear and quadratic terms).

A.4 Screenshots from the Choice Process in the Exchange

Screenshots from the Massachusetts HIE (circa October 2009) are below:

Account Login • En Español • Help • Contact Us

News: "E-Pay" for Commonwealth Choice members.

Home Find Insurance Health Care Reform About Us SEARCH

You need health insurance. The state's Health Connector can help.

Find the right health plan for you or your family.

- Compare plans. We'll let you know if you might qualify for a low or no-cost plan.

GET STARTED

Individuals & Families Young Adults Employees Employers Brokers

Account Login • En Español • Help • Contact Us

Home Find Insurance Health Care Reform About Us SEARCH

Overview > Find a Plan > FAQ

Find Insurance: *Individuals & Families*

FIND INSURANCE TODAY

We can help you find health insurance that is a good value. Explore the choices. Find the plan that is right for you.

Use the box at right to get started.

EXEMPTIONS FROM THE MANDATE

Don't think that you can afford health insurance? Learn if you might be exempt from the Health Care Reform law's penalties.

[More on exemptions...](#)

RENEWING YOUR COMMONWEALTH CHOICE PLAN?

Want to change your plan during your open enrollment or renewal period? Call 1-866-636-4654. The TTY line for

Get Started

Your family size is: 2 ([change](#))

! If your current gross family income is **less than \$43,716.00/yr** (\$3,643.00/mo), you may be eligible for the [Commonwealth Care program](#).

.....

If your current gross family income is **more than this level**, then...

SHOP FOR INSURANCE NOW



Step 1: Eligibility

Overview * Find a Plan * FAQ
Step 2: Provide information

Step 3: Choose type of plan

Step 4: Compare plans

Step 5: Confirm your plan

Step 6: Enroll

Find Insurance: *Individuals & Families or Young Adults*

STEP 2 OF 6 - PROVIDE INFORMATION

To begin, please provide us with some basic information.

Health insurance rates depend on where you live, your age, and the number of people you want to insure.

Decide who you want to cover. Yourself? Your immediate family?

Young Adult Plans for 18-26 year-olds are for individuals only.

All rates were negotiated by the Health Connector. The rating method is approved by the Massachusetts Division of Insurance.

Residential Zip Code: 02138

Your date of birth: 01 / 01 / 1970
(mm / dd / yyyy)
(month / day / year)

Your spouse's date of birth: 01 / 01 / 1970
(mm / dd / yyyy)
(month / day / year)

Select Coverage Type:

- Self
- Self + spouse / domestic partner
- Self + dependent child/children
- Family

Effective date of coverage: 1st day of November 2009

Continue



Step 1: Eligibility

Overview * Find a Plan * FAQ
Step 2: Provide information

Step 3: Choose type of plan

Step 4: Compare plans

Step 5: Confirm your plan

Step 6: Enroll

Find Insurance: *Individuals & Families*

STEP 3 OF 6 - CHOOSE TYPE OF PLAN

Using your information, we found 21 Health Connector plans for you. Click the plans that you want to see. You can click "Show Selected Plans" to see some plans. You can also decide to see all plans.

Show Selected Plans

Show All Plans

<input type="checkbox"/>	Bronze	Low premium. Most have deductibles and co-payments. Prescription drug coverage included.	6 plans	\$586.00 - \$689.15/mo
<input type="checkbox"/>	Silver	Moderate co-payments. Some have no deductible. Prescription drug coverage included.	10 plans	\$810.93 - \$1,003.67/mo
<input type="checkbox"/>	Gold	Low co-payments. No deductible. Prescription drug coverage included.	5 plans	\$1,108.60 - \$1,333.84/mo

Show Selected Plans

Show All Plans





- ✓ Step 1: Eligibility
- ✓ Step 2: Provide information
- ✓ Step 3: Choose type of plan
- Step 4: Compare plans
- Step 5: Confirm your plan
- Step 6: Enroll

Find Insurance: *Individuals & Families*

STEP 4 OF 6 - COMPARE PLANS (OVERVIEW)

Click "View Plan" to see details. You can also compare up to 3 plans at a time. Check the box next to the plans you want to compare. Then click "Compare Selected Plans."

Compare Selected Plans

Tier	Plan	Premium*	Deductible	Co-Payments			Hospital Stay	Doctors You Can See	Choose Plan
				Doctor	RX	ER			
B	<input checked="" type="checkbox"/> Fallon Community Health Plan FCHP Direct Care	\$586.00	\$2,000/\$4,000	\$25	\$15 / \$50 / \$100	\$200	\$500 per admission after deductible	Find Doctor	View Plan
B	<input type="checkbox"/> Neighborhood Health Plan NHP Three Select	\$636.22	\$2,000/\$4,000	\$25	\$15 after Rx deductible / 50% co-insurance after Rx deductible / 50% co-insurance after Rx deductible	\$100 after deductible	20% co-insurance after deductible	Find Doctor	View Plan
B	<input type="checkbox"/> Harvard Pilgrim Health Care Harvard Pilgrim Core Coverage 1750	\$641.71	\$1,750/\$3,500	\$25 copay up to 3 medical care office visits per individual (or 6 per family); next visits are subject to the deductible; then 20% co-insurance thereafter	\$15 / 50% co-insurance after Rx deductible / 50% co-insurance after Rx deductible	\$250	20% co-insurance after deductible	Find Doctor	View Plan
B	<input type="checkbox"/> Fallon Community Health Plan FCHP Select Care	\$676.00	\$2,000/\$4,000	\$25	\$15 / \$50 / \$100	\$200	\$500 per admission after deductible	Find Doctor	View Plan
B	<input type="checkbox"/> Tufts Health Plan Advantage HMO Select 2000 <i>(Limited choice of doctors & hospitals)</i>	\$676.73	\$2,000/\$4,000	\$40	\$20 after Rx deductible / \$50 after Rx deductible / \$75 after Rx deductible	\$200	\$0 after deductible	Find Doctor	View Plan
B	<input type="checkbox"/> Blue Cross Blue Shield of Massachusetts HMO Blue Basic Value	\$689.15	\$250 per plan year / \$500 per plan year	\$25	\$15 / 50% co-insurance after Rx deductible / 50% co-insurance after Rx deductible	\$200	25% co-insurance after deductible	Find Doctor	View Plan
S	<input type="checkbox"/> Tufts Health Plan Advantage HMO Select 750 <i>(Limited choice of doctors & hospitals)</i>	\$810.93	\$750/\$1,500	\$15	\$10 after Rx deductible / \$30 after Rx deductible / \$45 after Rx deductible	\$200	\$0 after deductible	Find Doctor	View Plan

Find Insurance: **Individuals & Families**

STEP 4 OF 6 - COMPARE PLANS (DETAILS)

Here are the details of the plan(s) that you are comparing.

Note: Premiums as of 9/25/2009 for an effective date of 11/1/2009.

[Print this page](#)

Choose Plan	
CARRIER NAME	FALLON COMMUNITY HEALTH PLAN
Plan Name	FCHP Direct Care
With or Without Pharmacy (Rx)	With Rx
Connector Plan Tier	Bronze
PLAN DETAILS	Download Plan Details
PREMIUM	\$586.00
ANNUAL DEDUCTIBLE ¹	
Per person	\$2,000
Family total	\$4,000
ANNUAL OUT-OF-POCKET (OOP) MAXIMUM ²	
Per person	\$5,000
Family total	\$10,000
Costs that count towards OOP maximum	
↳ Office visit: Adult routine physical	Yes
↳ Office visit: Routine gynecological (GYN) exam	Yes
↳ Office visit: Well-child care	Yes
↳ Office visit: All other visits to PCP	Yes
↳ Office visit: Specialist	Yes
↳ Prescription Drugs (Rx)	No