Online Appendix

Subsidizing Health Insurance for Low-Income Adults: Evidence from Massachusetts

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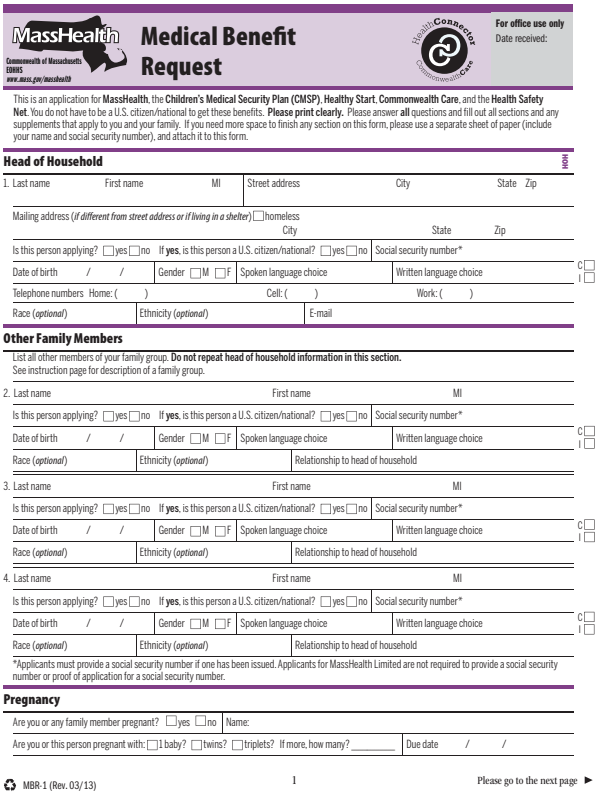
Appendix A: CommCare Application and Enrollment Forms

Application Form for CommCare

The following shows the application form that must be submitted to apply for CommCare. This form collects information on income, family status, and other sources of health insurance. The state uses this form to determine whether a person was eligible for CommCare, Medicaid (MassHealth) or neither. In addition to the main six pages below, there is a signature page and five pages of "supplements" that certain groups of applicants need to fill out.



MassHealth
Commonwealth of Massachusetts
EOHHS
www.mass.gov/masshealth

Medical Benefit Request

HealthConnector Commonwealth Care

For office use only
Date received:

This is an application for **MassHealth**, the **Children's Medical Security Plan (CMSP)**, **Healthy Start**, **Commonwealth Care**, and the **Health Safety Net**. You do not have to be a U.S. citizen/national to get these benefits. **Please print clearly.** Please answer **all** questions and fill out all sections and any supplements that apply to you and your family. If you need more space to finish any section on this form, please use a separate sheet of paper (include your name and social security number), and attach it to this form.

Head of Household HOH

1. Last name | First name | MI | Street address | City | State | Zip

Mailing address (*if different from street address or if living in a shelter*) ☐ homeless
City | State | Zip

Is this person applying? ☐ yes ☐ no If **yes**, is this person a U.S. citizen/national? ☐ yes ☐ no | Social security number*

Date of birth / / | Gender ☐ M ☐ F | Spoken language choice | Written language choice | C ☐ I ☐

Telephone numbers Home: ( ) Cell: ( ) Work: ( )

Race (*optional*) | Ethnicity (*optional*) | E-mail

Other Family Members

List all other members of your family group. **Do not repeat head of household information in this section.**
See instruction page for description of a family group.

2. Last name | First name | MI

Is this person applying? ☐ yes ☐ no If **yes**, is this person a U.S. citizen/national? ☐ yes ☐ no | Social security number*

Date of birth / / | Gender ☐ M ☐ F | Spoken language choice | Written language choice | C ☐ I ☐

Race (*optional*) | Ethnicity (*optional*) | Relationship to head of household

3. Last name | First name | MI

Is this person applying? ☐ yes ☐ no If **yes**, is this person a U.S. citizen/national? ☐ yes ☐ no | Social security number*

Date of birth / / | Gender ☐ M ☐ F | Spoken language choice | Written language choice | C ☐ I ☐

Race (*optional*) | Ethnicity (*optional*) | Relationship to head of household

4. Last name | First name | MI

Is this person applying? ☐ yes ☐ no If **yes**, is this person a U.S. citizen/national? ☐ yes ☐ no | Social security number*

Date of birth / / | Gender ☐ M ☐ F | Spoken language choice | Written language choice | C ☐ I ☐

Race (*optional*) | Ethnicity (*optional*) | Relationship to head of household

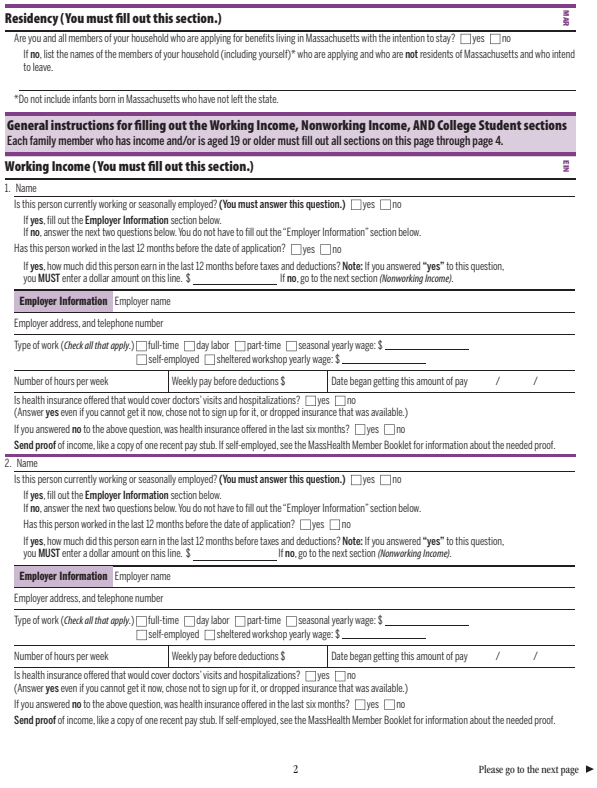
*Applicants must provide a social security number if one has been issued. Applicants for MassHealth Limited are not required to provide a social security number or proof of application for a social security number.

Pregnancy

Are you or any family member pregnant? ☐ yes ☐ no | Name:

Are you or this person pregnant with: ☐ 1 baby? ☐ twins? ☐ triplets? If more, how many? _____ | Due date / /

♻ MBR-1 (Rev. 03/13) 1 Please go to the next page ►



Residency (You must fill out this section.) M.AD

Are you and all members of your household who are applying for benefits living in Massachusetts with the intention to stay? ☐ yes ☐ no

If **no**, list the names of the members of your household (including yourself)* who are applying and who are **not** residents of Massachusetts and who intend to leave.

*Do not include infants born in Massachusetts who have not left the state.

General instructions for filling out the Working Income, Nonworking Income, AND College Student sections
Each family member who has income and/or is aged 19 or older must fill out all sections on this page through page 4.

Working Income (You must fill out this section.) E.WK

1. Name

Is this person currently working or seasonally employed? **(You must answer this question.)** ☐ yes ☐ no

If **yes**, fill out the **Employer Information** section below.
If **no**, answer the next two questions below. You do not have to fill out the "Employer Information" section below.

Has this person worked in the last 12 months before the date of application? ☐ yes ☐ no

If **yes**, how much did this person earn in the last 12 months before taxes and deductions? **Note:** If you answered **"yes"** to this question, you **MUST** enter a dollar amount on this line. $ _____ If **no**, go to the next section *(Nonworking Income)*.

Employer Information Employer name

Employer address, and telephone number

Type of work (*Check all that apply.*) ☐ full-time ☐ day labor ☐ part-time ☐ seasonal yearly wage: $ _____
☐ self-employed ☐ sheltered workshop yearly wage: $ _____

Number of hours per week | Weekly pay before deductions $ | Date began getting this amount of pay / /

Is health insurance offered that would cover doctors' visits and hospitalizations? ☐ yes ☐ no
(Answer **yes** even if you cannot get it now, chose not to sign up for it, or dropped insurance that was available.)

If you answered **no** to the above question, was health insurance offered in the last six months? ☐ yes ☐ no

Send proof of income, like a copy of one recent pay stub. If self-employed, see the MassHealth Member Booklet for information about the needed proof.

2. Name

Is this person currently working or seasonally employed? **(You must answer this question.)** ☐ yes ☐ no

If **yes**, fill out the **Employer Information** section below.
If **no**, answer the next two questions below. You do not have to fill out the "Employer Information" section below.

Has this person worked in the last 12 months before the date of application? ☐ yes ☐ no

If **yes**, how much did this person earn in the last 12 months before taxes and deductions? **Note:** If you answered **"yes"** to this question, you **MUST** enter a dollar amount on this line. $ _____ If **no**, go to the next section *(Nonworking Income)*.

Employer Information Employer name

Employer address, and telephone number

Type of work (*Check all that apply.*) ☐ full-time ☐ day labor ☐ part-time ☐ seasonal yearly wage: $ _____
☐ self-employed ☐ sheltered workshop yearly wage: $ _____

Number of hours per week | Weekly pay before deductions $ | Date began getting this amount of pay / /

Is health insurance offered that would cover doctors' visits and hospitalizations? ☐ yes ☐ no
(Answer **yes** even if you cannot get it now, chose not to sign up for it, or dropped insurance that was available.)

If you answered **no** to the above question, was health insurance offered in the last six months? ☐ yes ☐ no

Send proof of income, like a copy of one recent pay stub. If self-employed, see the MassHealth Member Booklet for information about the needed proof.

2 Please go to the next page ►

Nonworking Income (You must fill out this section.)

Rental Income Do you or any family member get rental income? **(You must answer this question.)** ☐yes ☐no REN

If **yes**, enter the monthly amount of rental income (before taxes and deductions) on this line. $ _____

Name of person getting rental income

If **no**, go to the next section (*Unemployment Benefits*).

Send proof of rental income.

Unemployment Benefits Are you or any family member getting an unemployment check? **(You must answer this question.)** ☐yes ☐no UEN

If **yes**, fill out this section and answer all questions. **Send proof** of unemployment benefits.
If **no**, go to the next section (*Other Nonworking Income*).

Name of person getting unemployment benefits

Is this check from the Commonwealth of Massachusetts? ☐yes ☐no

If **yes**, in the 12 months before this person became unemployed, did this person work for an employer in Massachusetts? ☐yes ☐no
(Do not include federal employers, like the U.S. Postal Service.)

Enter the monthly amount of unemployment benefits (before taxes and deductions). $ _____

Name of person getting unemployment benefits

Is this check from the Commonwealth of Massachusetts? ☐yes ☐no

If **yes**, in the 12 months before this person became unemployed, did this person work for an employer in Massachusetts? ☐yes ☐no
(Do not include federal employers, like the U.S. Postal Service.)

Enter the monthly amount of unemployment benefits (before taxes and deductions). $ _____

Other Nonworking Income Do you or any family member have any other income? **(You must answer this question.)** ☐yes ☐no UIN

If **yes**, fill out this section.
If **no**, go to the next section (*College Student*).

Please describe the source of the income (where it comes from) for each family member. If anyone has more than one source, list on separate lines.

Send proof. Some types of other income are: (You do not have to send proof of social security or SSI income.)
- alimony
- annuities
- child support
- dividends or interest
- pensions
- retirement
- social security
- SSI
- trusts
- veterans' benefits (federal, state, or city)
- workers' compensation
- other (*Please describe below.*)

Name	Type of income (all that apply from list above)
Source (where the income comes from)	Monthly amount before taxes $
Name	Type of income (all that apply from list above)
Source (where the income comes from)	Monthly amount before taxes $
Name	Type of income (all that apply from list above)
Source (where the income comes from)	Monthly amount before taxes $

College Student (You must fill out this section.)

Are you or any family member a college student? **(You must answer this question.)** ☐yes ☐no

If **yes**, fill out this section and answer all questions.
If **no**, go to the next section (*Health Insurance You Have Now and Subsidized Health Insurance You May Be Eligible For*).

1. Name of college student

Is this person eligible for health insurance from college? ☐yes ☐no

Is this person a college student in Massachusetts with at least 75% of a full-time schedule? ☐yes ☐no
(**Note:** If you are not sure that this person has 75% of a full-time schedule, contact the school to find out if the number of credits the student is taking would require the student to get the health insurance the school offers to students.)

If yes, is this student planning to get health-insurance coverage from the school, but is waiting for coverage to start? ☐yes ☐no

If yes, what is the date that the school health-insurance coverage starts? ___ / ___ / ___

2. Name of college student

Is this person eligible for health insurance from college? ☐yes ☐no

Is this person a college student in Massachusetts with at least 75% of a full-time schedule? ☐yes ☐no
(**Note:** If you are not sure that this person has 75% of a full-time schedule, contact the school to find out if the number of credits the student is taking would require the student to get the health insurance the school offers to students.)

If yes, is this student planning to get health-insurance coverage from the school, but is waiting for coverage to start? ☐yes ☐no

If yes, what is the date that the school health-insurance coverage starts? ___ / ___ / ___

Health Insurance You Have Now and Subsidized Health Insurance You May Be Eligible For

Even if you or any family member have other health insurance, MassHealth may be able to help you pay your premiums. Health insurance can be from an employer, an absent parent, a union, a school, Medicare, or Medicare supplemental insurance, like Medex. **All applicants must fill out the health insurance section. Do not include MassHealth or any health plan you enrolled in through Commonwealth Care when answering the questions below.**

Do you or any family member get Medicare benefits? ☐yes ☐no

If **yes**, name(s):

Claim number(s):

Do you or any family member have health insurance other than Medicare? ☐yes ☐no

If **yes**, fill out both **Part A** below and **Part B** on the next page.
If **no**, fill out **Part B** on the next page.

Part A: Health Insurance You Have Now

1. Policyholder name | Date of birth / /

Social security number* | Insurance company name

Policy type (*Check one.*) ☐individual ☐couple (two adults) ☐dual (one adult, one child) ☐family | Policy start date ___ / ___ / ___

Policy number | Group number (if known)

Employer or union name

Policyholder contribution to premium costs (*Complete one.*) $ per week | $ per quarter | $ per month

Insurance type (*Check one.*) ☐employer or union subsidized (employer or union pays some or all of the insurance cost) ☐TRICARE
☐other federal or state subsidized (government pays some or all of the insurance cost) ☐student health insurance through school
☐nonsubsidized, like self-employment or COBRA (policyholder pays total insurance cost) ☐Medical Security Program

Names of covered family members

Insurance coverage (*Check all that apply.*) ☐doctors' visits and hospitalizations ☐catastrophic only ☐vision only ☐pharmacy only ☐dental only

If you have long-term-care insurance, **send a copy** of the policy.

* Required, if obtainable and one has been issued, whether or not this person is applying.

2. Policyholder name | Date of birth / /

Social security number* | Insurance company name

Policy type (*Check one.*) ☐individual ☐couple (two adults) ☐dual (one adult, one child) ☐family | Policy start date ___ / ___ / ___

Policy number | Group number (if known)

Employer or union name

Policyholder contribution to premium costs (*Complete one.*) $ per week | $ per quarter | $ per month

Insurance type (*Check one.*) ☐employer or union subsidized (employer or union pays some or all of the insurance cost) ☐TRICARE
☐other federal or state subsidized (government pays some or all of the insurance cost) ☐student health insurance through school
☐nonsubsidized, like self-employment or COBRA (policyholder pays total insurance cost) ☐Medical Security Program

Names of covered family members

Insurance coverage (*Check all that apply.*) ☐doctors' visits and hospitalizations ☐catastrophic only ☐vision only ☐pharmacy only ☐dental only

If you have long-term-care insurance, **send a copy** of the policy.

* Required, if obtainable and one has been issued, whether or not this person is applying.

Part B: Subsidized Health Insurance You May Be Eligible For

Are you or any member of your family in one of the uniformed services? ☐yes ☐no

If **yes**, fill out the section below. (The uniformed services are the Army, Navy, Air Force, Marine Corps, Coast Guard, Public Health Services, National Oceanic and Atmospheric Administration, and the National Guard or Reserves.)

1. Name:

Active Duty? ☐yes ☐no	Retiree? ☐yes ☐no	Reserves? ☐yes ☐no	Medal of Honor? ☐yes ☐no

2. Name:

Active Duty? ☐yes ☐no	Retiree? ☐yes ☐no	Reserves? ☐yes ☐no	Medal of Honor? ☐yes ☐no

Have you or any member of your family served in the U.S. military or can you be considered a dependent of someone who has served in the U.S. military?

☐Yes, I have served. Name:

☐Yes, I am a dependent of someone who has served. Name:

☐No, I am neither a veteran nor a dependent.

American Indian/Alaska Native

Certain American Indians and Alaska Natives may not have to pay MassHealth premiums and copays.

Are you or any member of your family who is applying a federally recognized American Indian or Alaska Native who is eligible to receive or has received services from an Indian health-care provider or from a non-Indian health-care provider through referral from an Indian health-care provider? ☐yes ☐no

If **yes**, name of person(s):

General instructions for filling out the Injury, Illness, Disability, or Accommodation, Absent Parent, and U.S. Citizenship/National Status and Immigration Status sections below

The HIV section is optional. You must answer all questions in each of the three sections after the HIV section.

HIV Information (optional) HIV

MassHealth may give benefits to people who are HIV positive who might not otherwise be eligible.

Do you or any family member who is HIV positive want to apply for these benefits? ☐yes ☐no

If **yes**, fill out this section.

Send proof of income, U.S. citizenship/national status and identity, or qualified alien status to see if you can get benefits for up to 60 days while we wait for you to send us proof of your HIV-positive status. For more information, see the MassHealth Member Booklet.

Name(s):

Injury, Illness, Disability, or Accommodation

Do you or any family member have an injury, illness, or disability (including a disabling mental-health condition) that has lasted or is expected to last for at least 12 months? (If legally blind, answer **yes**.) ☐yes ☐no

Do you or any family member need health care because of an accident or injury? ☐yes ☐no

Do you or any family member applying for MassHealth require a reasonable accommodation because of a disability or injury? ☐yes ☐no

If you answered **yes** to any of these three questions, you must fill out **Supplement A** (the blue sheet).

Absent Parent

Has any child in the household been adopted by a single parent or has a parent who is deceased or unknown? ☐yes ☐no

Does any child in the family have a parent who does not live with you who is not included in the previous question? ☐yes ☐no

If you answered **yes** to either of these questions, you must fill out **Supplement B** (the yellow sheet).

U.S. Citizenship/National Status and Immigration Status

The U.S. citizenship/national status of parents does not affect the eligibility of their children.

U.S. Citizens

For applicants **born in Massachusetts** who want help getting proof of their U.S. citizenship, please fill out **Supplement D** (the red sheet).

For applicants **born outside Massachusetts** who want help getting proof of their U.S. citizenship, MassHealth may be able to help you. Please call MassHealth Customer Service at 1-800-841-2900 (TTY: 1-800-497-4648 for people who are deaf, hard of hearing, or speech disabled).

Persons who are not U.S. citizens/nationals

If you or any other family member applying for MassHealth or Commonwealth Care fits any of the immigration status codes on **Supplement C** (the orange sheet), numbered 1 through 17, you must fill out **Supplement C**.

If you or any other family member applying for benefits does not fit any of the immigration status codes on **Supplement C** (the orange sheet), numbered 1 through 17, you or that family member may get only one or more of the following: MassHealth Limited, Healthy Start, CMSP, or the Health Safety Net. You do not have to fill out **Supplement C**.

Note: A social security number is not required for approval for MassHealth Limited. We will not match the names of applicants for MassHealth Limited with any other agency including the Department of Homeland Security (DHS). You do not need to send proof of immigration status. MassHealth Limited pays for emergency services only. See the MassHealth Member Booklet for more information.

List below the names of family members who want to get only one or more of the following: MassHealth Limited, Healthy Start, CMSP, or the Health Safety Net.

Name(s):

Name(s):

CommCare Plan Choice Form

The following shows the "plan choice form" received when they were accepted to CommCare (after submitting the application form shown above). The form is a letter that shows an enrollee their plan choice options and associated premiums and refers enrollees to a website for more information on plans (e.g., on provider networks). The form prompts enrollees to go online or call the Connector to choose a plan and make the necessary premium payment. A portion of this plan choice form was shown in Figure 1 in the text.

HealthConnector
CommonwealthCare

Your **connection** to good health

[Mail_date]
[Case_Name]
[Case_Street]
[Case_City], [Case_State] [Case_Zip]

Dear [Insert Name]

Welcome to Commonwealth Care. Here is the enrollment package you requested. This information will help you select and enroll in the health plan that is right for you. Your package includes:

- ***Getting Started***, a brochure about Commonwealth Care that explains the program and how to enroll.
- ***Health Benefits and Copays***, a chart that lists your health benefits and how much you pay for each health visit or service (copays).
- ***Health Plan Information***, descriptions of each health plan available to you and any special programs they offer. The health plans available to you depend on where you live, your plan type and in some cases, whether you've been previously enrolled with Commonwealth Care or MassHealth.
- ***Enroll Now***, information and instructions for selecting and enrolling in a health plan.

There are a lot of benefits to enrolling in Commonwealth Care: you get your own health care provider, regular checkups, care when you are sick or injured, prescriptions, treatment for alcohol, drug abuse and mental health problems, vision care and free glasses. Some members also receive dental benefits (Plan Type 1 only).

You can enroll in Commonwealth Care over the phone and online.*

1. **By phone**: Call the Commonwealth Care Member Service Center Monday - Friday, from 8:00 a.m. to 5:00 p.m. at 1-877 MA ENROLL (1-877-623-6765) TTY 1-877-623-7773 for people with partial or total hearing loss.
2. **Online**: Enroll using the Commonwealth Care website at www.MAhealthconnector.org. Read the instructions on the back of this letter to learn how to create an account and log in.

If you have any questions, call the Commonwealth Care Member Service Center Monday - Friday, from 8:00 a.m. to 5:00 p.m. at 1-877 MA ENROLL (1-877-623-6765) TTY 1-877-623-7773 for people with partial or total hearing loss.

We are pleased to offer you a full range of health benefits and be your connection to good health.

Commonwealth Care Member Service Center

Turn to review your health plan options

Member ID

Enroll Now! Select and Enroll in a Commonwealth Care health plan

Below are the Commonwealth Care health plans you can choose from. The dollar amount next to each health plan is what you must pay each month to stay enrolled in that plan. If you select a health plan with $0.00 next to it, you will not be charged a monthly premium. The premiums listed below are based on your plan type, which depends on your income and your family size. Based on the information you provided, you are eligible for **Plan Type X**.

1. Choose your health plan and premium. Choose only one.
These plans are available to you. Read each Health Plan Information description to learn about the Commonwealth Care health plans.

<BMC HealthNet Plan	$0.00	web address	Phone number>
<CeltiCare Health Plan	$0.00	web address	Phone number>
<Fallon Community Health Plan	$0.00	web address	Phone number>
<Neighborhood Health Plan	$0.00	web address	Phone number>
<Network Health	$0.00	web address	Phone number>

2. Choose your Primary Care Provider (PCP).
Tell us the name of your PCP when you select your health plan by phone or online.* When choosing a health plan, check to see if the doctors, hospitals or community health center you visit today are part of the plan you would like to select. To find out if a provider is in a certain health plan, look on our website or call the doctors, the health plans, or the Commonwealth Care Member Service Center.

You have selected_____**as your Primary Care Provider (PCP).**
First Name Last name

3. Enroll by phone, or online.* Enroll by phone or on our website. Commonwealth Care will send you a bill if you need to pay a monthly premium. After you pay your first monthly premium, you will be in Commonwealth Care. If you do not need to pay a monthly premium, Commonwealth Care will enroll you in your selected health plan.

If this is your first time using the website, follow the instructions below.

Create an account
1. Log on to www.MAhealthconnector.org
2. Click **Register** for access to your account
3. Click **Create Login** then follow the instructions on each screen

* If you are unable to call or go online, circle the health plan of your choice, write in the name of your PCP and mail this page to:
Commonwealth Care Member Service Center, 133 Portland St, 1st Floor, Boston MA 02114-1707.
DO NOT A SEND PAYMENT with your health plan selection.

Appendix B: Estimating the CommCare Eligible Population in the ACS

We estimate the size of the eligible CommCare population in Fiscal Year 2011 using data from the 2010-2011 American Community Survey (ACS). This appendix describes how we estimate the size of the population eligible for CommCare using the American Community Survey (ACS). Our estimation has two main steps: first, we apply CommCare's eligibility criteria to the ACS data to limit to the sample of individuals likely eligible for CommCare. Second, we estimate the eligible population by income bin, using a regression to smooth the raw counts in each bin. Below, we describe each step in detail.

Applying CommCare Eligibility to ACS Data

We begin with ACS data from 2010-2011, using both years because our CommCare year of interest, fiscal year 2011, spans July 2010-June 2011.[37] To take an average of the population across years, we multiply sample weights by 1/2.

We begin by defining family income as a share of the poverty line, analogous to the measure used by CommCare. Specifically, we sum total personal income across all members of an individual's "health insurance unit" (HIU), a variable defined by the University of Minnesota's SHADAC to approximate family unit definitions used by public insurance programs. We divide this total income by the FPL defined by the year and the HIU size.

We then define people as CommCare eligible if they are U.S. Citizens in the relevant age range (19-64) and income range (less than 300% FPL) who are not enrolled in another form of health insurance (specifically, employer insurance, Medicare, or Tricare) and are not eligible for Medicaid (based on income and demographics). We discuss each of these restrictions in turn. The top panel of table 4 shows the ACS sample size, the (unweighted) number of individuals dropped at each of stages, and the estimated population size (scaled up using 1/2 of the ACS person weights).

Restricting to the relevant age range (row 1) and income range (row 2) is straightforward. In row 3 we restrict to U.S. citizens. Nearly all non-citizens are ineligible for CommCare, with the exception of long-term green card holders (longer than 5 years). Because we cannot separately measure this latter group in the ACS, we exclude all non-citizens. In row 4, we exclude any individual who reports having employer-sponsored insurance (ESI), Medicare, Tricare, or privately purchased insurance. The remaining individuals have incomes/demographics that make them eligible for Medicaid or CommCare, and they are either enrolled in these programs or uninsured.[38]

The last two rows of the table show how we exclude individuals eligible for Medicaid (MassHealth) instead of CommCare. We cannot directly measure Medicaid eligibility in the ACS.[39] Instead, we approximate it by excluding the two largest groups we know are Medicaid eligible: parents with

[37] We obtained ACS data from the IPUMS-USA website (Ruggles et al., 2015).

[38] There are a very small number of individuals in this sample who have VA coverage but nothing else. These individuals are eligible for CommCare or MassHealth but have not taken it up, so we count them as "uninsured" for our purpose.

[39] We cannot even directly measure Medicaid enrollment; the ACS does not distinguish between Medicaid and CommCare (both are coded as "Medicaid/other public insurance").

income below 133% of FPL, and the disabled (proxied by under 65 and SSI receipt). Parents with dependents under 18 are eligible for Medicaid below 133% FPL and eligible for CommCare above this cut-off. We focus on income groups above the cutoff so that results are not affected by this large compositional change in eligibility, and use the 135% FPL cutoff to avoid ambiguity right at the 133% FPL cutoff and to maintain equal-size 5% FPL bins for later analysis. This approach misses a few groups who are Medicaid eligible but whom we cannot easily measure in the ACS – specifically, pregnant women below 200% FPL and HIV-positive people below 200% FPL. Based on the number of women below 200% FPL with a child under one year old, we estimate that pregnant women may constitute 0.4% of our eligible sample. The HIV-positive group is likely to be even smaller.[40]

The final sample in the ACS includes 2,856 observations. Scaling this up to a population size using the ACS's person weights, we estimate a CommCare-eligible population size of 168,041 Massachusetts residents earning 135-300% of FPL for FY 2011. These individuals do not have ESI, Medicare, Tricare, or nongroup coverage and based on their income and demographics are ineligible for Medicaid. Of these 105,241 (or 63%) report having health insurance (all via "Medicaid/other public insurance"). In theory, all of these people should have CommCare (since they are Medicaid-ineligible), so 63% is our estimated CommCare take-up rate in the ACS. Of course, income measurement error in the ACS may lead us to overstate or understate the eligible population.

Estimating Smoothed Eligible Population

We next use this restricted sample to estimate the CommCare-eligible population by income bin.

Figure 14 shows the raw estimates, with each point representing the estimated eligible population size for a 5% of FPL bin. These estimates are quite noisy, both because the ACS is a 1% sample and because of clustering in reported income at round numbers (which is emphasized in the very high outlier points). To prevent this noise from introducing error into our estimates of market shares from the administrative data, we construct a smoothed estimate of the eligible population by income bin. Specifically, we regress the raw population counts by 1% of FPL bin on a quadratic polynomial in income as a percentage of FPL. The predicted values from this regression (multiplied by 5 to match the 5% FPL bins we use in our analysis) are shown in the red curve in Figure 14.

We use the value of this curve at the midpoint of each income bin for our smoothed estimate of the CommCare-eligible population size.

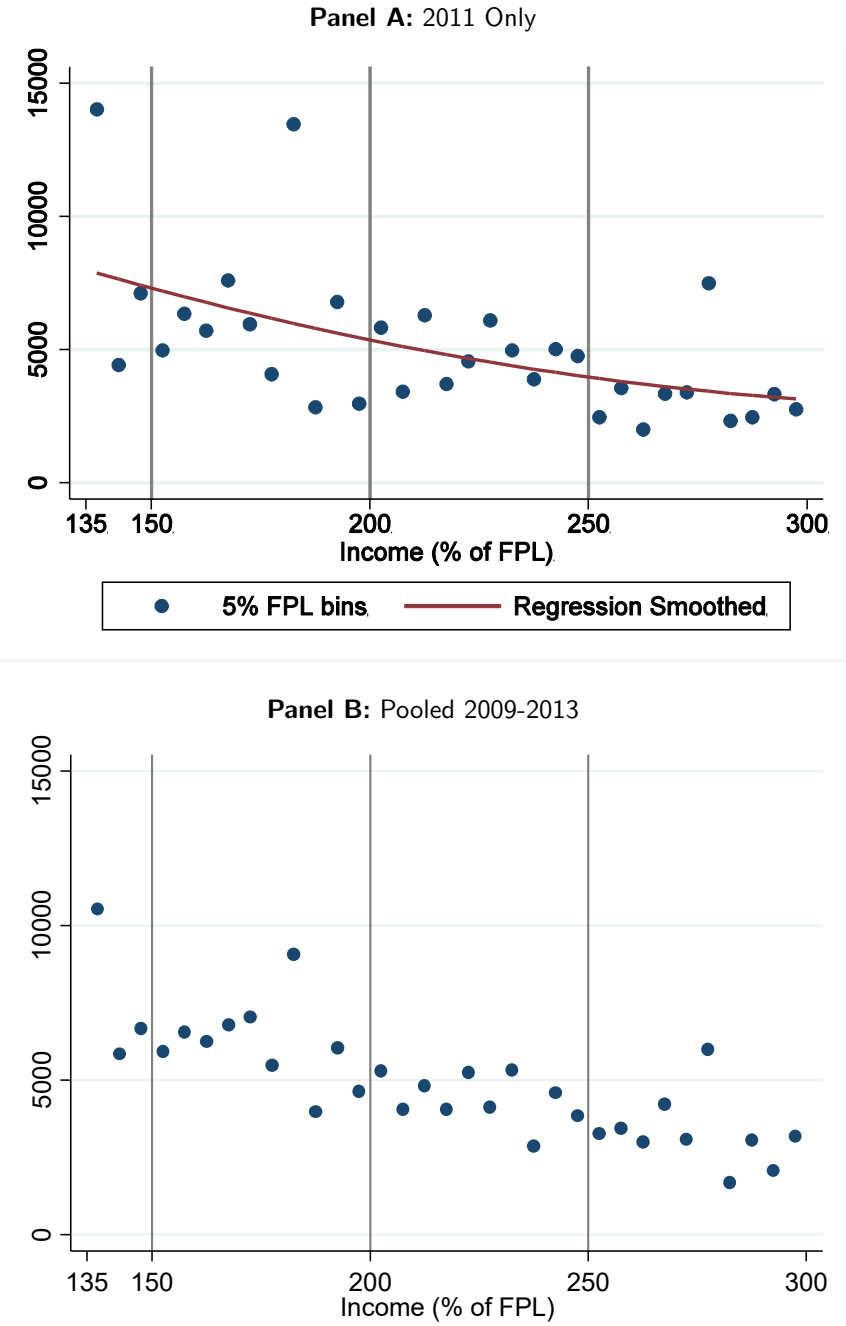
Appendix C: Construction of Cost Curves

Constructing C_H In addition to the average cost curves, we construct the cost to the insurer of of marginal enrollees, C_H. To do so, note that the *total costs* to the insurer under the H contract at prices $p = \{p_L, p_H\}$ equals:

$$TC_H(p) \equiv \int_0^{s^*_{HL}(p)} C_H(s)\, ds = s^*_{HL}(p) \cdot AC(s^*_{HL})$$

[40] Details of Medicaid eligibility rules are based on MMPI (2012).

Figure 14: Estimate of CommCare Eligible Population from ACS Data



NOTE: Panel A shows our smoothed estimates of the CommCare-eligible population from the 2010-2011 ACS data. The dots are raw estimates of the annual eligible population size (weighting by the ACS "person weight" to generate a population estimate) by 5% of FPL bin. Because these data are relatively noisy – especially at high outlier points that reflect round income numbers like $20,000 – we use a quadratic regression to generate a smoothed estimate of the eligible population size. The resulting estimates are shown in the curve. Panel B shows the raw estimates of the annual eligible population size from the pooled 2009-2013 ACS data.

Table 4: ACS Sample Construction

Sample / Exclusion	ACS Sample Size # Dropped	% Dropped	# Remaining	Est. Population # Remaining
Full ACS Mass. Sample (2010-11)			**135,009**	**6,572,395**
Drop Age <19 or ≥ 65	52,362	39%	82,647	4,147,512
Drop Income > 300% FPL	47,790	35%	34,857	1,863,450
Drop Non-Citizens	3,994	3%	30,863	1,602,621
Drop People with Medicare, ESI, Tricare	19,961	15%	10,902	601,145
Sample Eligible for CommCare or Medicaid	--	--	**10,902**	**601,145**
Limit to 135-300% FPL	7,862	72%	3,040	178,772
Drop Disabled (under 65 and receiving SSI)	184	2%	2,856	168,041
Final Sample	--	--	**2,856**	**168,041**

NOTE: The table shows how we construct our ACS sample of the population eligible for CommCare, as described in the text of Appendix B. It starts from the full ACS 2010 and 2011 (pooled) samples of Massachusetts residents and shows the number of observations dropped and remaining at each step. The final column refers to the estimated population size, applying the appropriate ACS "person weights" (and dividing in half to compute an annual estimate from the two years of pooled data).

where $AC(s)$ was defined in equation (5). This formula integrates over all the individuals who choose the H contract at these prices. Under the vertical model structure, this corresponds to types for which $s \leq s^*_{HL}(p_H - p_L)$.

Now, consider the variation induced by the discontinuities, where both p_L and p_H may vary. To capture this, we introduce some additional notation. Let θ parameterize the price changes at the discontinuity so that p_L changes by $\frac{dp_L}{d\theta}$ and p_H changes by $\frac{dp_H}{d\theta}$. The policy induces a change in $p_H - p_L$ of $\frac{d(p_H - p_L)}{d\theta} = \frac{dp_H}{d\theta} - \frac{dp_L}{d\theta}$. Despite the fact that both p_H and p_L vary at the discontinuities, one can still use variation induced by the policy to estimate $C_H(s)$. To see this note that:

$$\underbrace{\frac{dTC_H}{d\theta}}_{\text{Change in total costs in } H} = \underbrace{\frac{ds^*_{HL}}{d\theta}}_{\text{Change in } D_H} \times \underbrace{C_H(s^*_{HL})}_{\text{Cost of marginal consumers}}$$

where $\frac{dTC_H}{d\theta} = \frac{dTC_H}{d(p_H - p_L)}\frac{d(p_H - p_L)}{d\theta}$ is the impact of the policy change (i.e. the discontinuity) on total costs of the H insurers and $\frac{ds_{HL}}{d\theta} = \frac{ds_{HL}}{d(p_H - p_L)}\frac{d(p_H - p_L)}{d\theta}$ is the net impact of the policy on demand for H (since $D_H = s^*_{HL}$). Given estimates of the policy change on total costs of H, $\frac{dTC_H}{d\theta}$ and on demand for H, $\frac{dD_H}{d\theta} = \frac{ds_{HL}}{d\theta}$, we can solve for the cost of the marginal type in the H contract, $s^*_{HL}(p)$,

$$C_H(s^*_{HL}) = \frac{\frac{dTC_H}{d\theta}}{\frac{dD_H}{d\theta}}. \tag{6}$$

Because the pricing change does not affect the costs of infra-marginal types, we can infer the costs of the marginal group by measuring the change in total costs and demand for H. This logic is identical to the two-plan case considered in past work (Einav, Finkelstein, and Cullen, 2010). The key requirement for equation (6) to be valid is that p_H and p_L do not change by the same amount at the discontinuities

(so that $d(p_H - p_L) \neq 0$.)[41]

Panel B of Figures 7 and 8 showed how shares (D_H) and average costs (or AC_H) changed at the pricing discontinuities. We map these – using the AC_H curve adjusted to 150% of FPL from Panel B of Figure 12 – into C_H in (6) using the identity that total costs equal average costs times demand: $TC_H = AC_H \cdot D_H$. The resulting $C_H(s)$ curve is shown in Figure 13, along with the previously estimated curves $W_{H,}$, AC_H and W_L. We place the C_H values along the horizontal axis points that correspond to the midpoint of the relevant average cost segment. The downward slope of each average cost curve in turn implies that the cost curve $C_H(s)$ lies below the average cost curve, $AC_H(s)$.

Constructing C_L Because we do not have variation in p_L and p_H that is orthogonal to $p_H - p_L$, we cannot use the same method to estimate AC_L and C_L. Absent such independent variation in prices, it is difficult to separate the costs of those who enter/exit the L plan into the H plan, and those who enter/exit the L plan into uninsurance, U. Appendix Figure 24 shows the regression discontinuity results for enrollment in the L plan, the L plan's market share, and average monthly insurer costs among L enrollees. We see statistically significant decreases in enrollment and increases in costs at the 150% threshold. There is little evidence of changes at other thresholds.

However, we can draw some inferences about C_L by exploiting the fact that the market share of L is relatively small.This implies that the average L enrollee is similar to the marginal enrollee. For instance, just above 150% FPL, Appendix Figure 24 shows that just 6% of the population enrolls in the L plan, and we estimate (see Figure 10, Panel A) that the marginal individual who enrollees at that premium is at $s = 0.70$ in the WTP distribution. Thus, the 6% who buy at that premium span $s \in [0.64, 0.70]$, and the average cost of the L plan just above 150% FPL provides an approximation to $C_L(s)$ for individuals in this narrow range of WTP.

We use this strategy to estimate the $C_L(s)$ for individuals at 150% of FPL. A similar strategy could be used at other income thresholds but we focus on 150% for simplicity. In practice, this means that we use our estimates (see Appendix Table 6) of the average C_L of \$169 per month for those enrolled just below 150% FPL (where the relevant s range is $s \in [0.80, 0.94]$) and \$242 per month just above 150% FPL (where the relevant s range is $s \in [0.64, 0.70]$).[42]

We include these two $C_L(s)$ points (locating them at the midpoint of each s range) in Figure 13. The implied C_L curve is quite similar to the C_H curve over the regions of the s distribution where both are observed. This suggests that obtaining the more generous H contract instead of the L contract does not significantly increase costs. Therefore the much lower observed average cost in the L plan (see Table 1) is driven largely by favorable selection rather than by the causal impact of the plan on costs for the same type, s (i.e. moral hazard).

[41] Note that although the impact on demand is driven both by changes in p_H and p_L, we only need to observe the *net* impact on demand and costs. Under the vertical model, there is only one type of marginal consumer for the H plan – i.e., those with $s = s^*_{HL}$.

[42] Note that the empirical distribution of average claims for those in L shown in Appendix Figure 24, Panel C is not the analog of the "average cost" concept defined in equation (5) since the figure shows average claims for all those enrolled in L; some individuals with higher WTP will in fact enroll in H.

Appendix D: Extrapolating out of sample

Appendix Figure 15 shows the simple extrapolation we used to approximate willingness to pay and cost out of sample; we use this out-of-sample extrapolation only for the 100% and 50% subsidy counterfactuals in Table 2.

We extrapolate by extending the left-most segments of W_H and AC_H linearly to the left (and recalculating c_H using equation (6)).[43] Likewise, we extend the right-most segments of W_H and AC_H out to its value above the right-most value of W_L that we observe ($s = 94\%$) using a linear extrapolation of the right-most segment of the ΔW_{HL} and AC_H curves.[44]

This extrapolation leads to estimates of willingness to pay that are still everywhere far below average and own costs. Because demand lies everywhere below average costs (falling short by more than \$225; W_H never exceeds 52% of average costs), our extrapolation suggests the market would fully unravel in the absence of large government subsidies. Because individuals' WTP lies everywhere below their own expected cost they impose on the insurer (by at least \$140; W_H never exceeds 53% of C_H), this suggests that even if insurers were able to price discriminate on WTP type (i.e., based on s), the market would unravel. In this sense, adverse selection cannot explain the low take up of H by low-income individuals. Even if the quantile of WTP, s, were known to insurers and they were allowed to price on this information, they would still not be able to profitably sell insurance.

Naturally, a concern with this linear extrapolation is that it assumes away the possibility that there is a subset of the population with much higher demand than other types, so that demand increases non-linearly. While we cannot of course rule this out, the most natural source for willingness to pay increasing non-linearly would be if the variance of costs (i.e. risk) were higher for higher willingness to pay individuals, and this does not appear to be the case. To test for this, Appendix Figure 16 explores how the standard deviation of costs changes around our pricing discontinuities. While the results are fairly noisy, there is no evidence that the standard deviation of costs is increasing at the price discontinuities where willingness to pay of those enrolled is also increasing. While this does not guarantee that the linear extrapolation is appropriate, it does suggest that it is not entirely inconsistent with the underlying cost variation in the data.

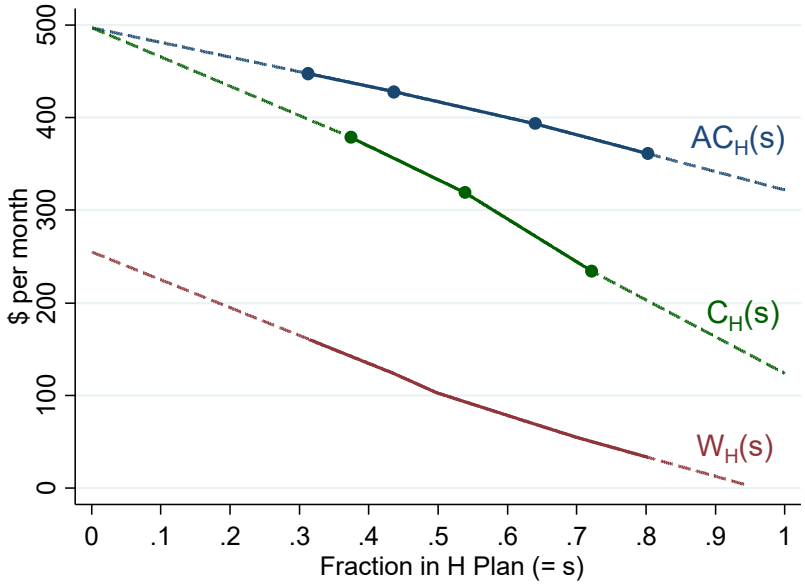
Appendix E: WTP Estimates without a Vertical Model

Our vertical model involves non-trivial assumptions about the nature of the market and preferences of consumers. These assumptions – while reasonable for CommCare in 2011 – will not be reasonable in all settings, including for CommCare in other years. In this section, we develop a model with fewer assumptions that gives us bounds on the WTP for access to a given set of insurance plans.

[43] It would also be possible to extrapolate c_H linearly and recalculate AC_H accordingly. In practice, this produces even higher estimates of both cost curves, meaning that our conclusion that WTP is entirely below costs is unchanged.

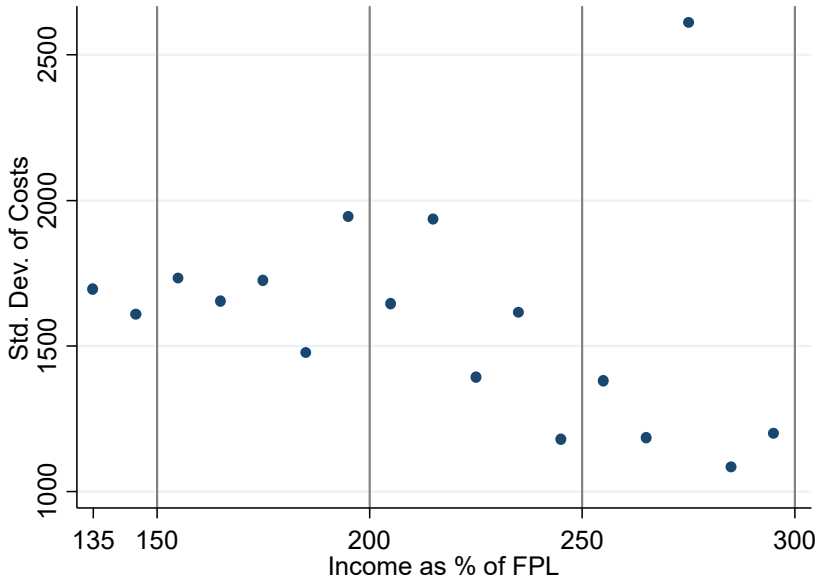
[44] Interestingly, W_H is quite close to zero at this point (about \$4). This does not occur by construction but is consistent with the idea that these people have virtually no willingness to pay for health insurance, whether H or L. The model implies that W_L is zero or negative for the rest of the s distribution, and based on the estimates, the same is also true of W_H; in the context of the model, this can be explained by transaction costs in enrolling (even at a zero "sticker" price), which reduces the net willingness to pay for a formal contract below the uninsured option. Of course, it is also possible that these 6% who do not enroll at zero price are uninformed about their eligibility (e.g. Bhargava and Manoli (2015)).

Figure 15: Value and Cost of H – Extrapolation



NOTE: The figure shows out-of-sample extrapolations for W_H, AC_H and C_H. The solid lines are our in-sample estimates, identical to those shown in Figure 13. The dashed lines are the extrapolations. Both W_H and AC_H are extrapolated linearly using the slope of the left-most and right-most line segment. C_H is extrapolated by calculating C_H based on the implied values from AC_H, applying the formula for C_H in equation (6).

Figure 16: Standard Deviation of Insurer Costs across Enrollees, by %FPL (H Plan)



NOTE: The graph shows the standard deviation of insurer costs, by 10% of FPL bin. The standard deviation is calculated across individuals in the data for 2011, using each individuals average insurer-paid cost per month enrolled. As we discuss in the text, there is little evidence that the standard deviation jumps discretely at the income thresholds where subsidies and take-up changes.

Setup and WTP for Insurance The setup is very general. Consider an insurance market with plan options $j = 1, ..., J$ and an outside option of uninsurance, $j = U$. Let W_{ij} be the willingness to pay of consumer i for plan j, where we normalize WTP relative to $W_{iU} = 0$. Let p_{ij} be the premium of each plan (which can vary across consumers), where we also normalize $p_{iU} = 0$. Consumers choose among available options to maximize their utility, which equals:

$$u_{ij} = W_{ij} - p_{ij}.$$

Note that by our normalizations, $u_{iU} = 0$.

We would like to estimate the willingness to pay for (any) CommCare insurance (W_i^{Ins}), defined as the willingness to pay for each consumer's most preferred plan:

$$W_i^{Ins} = \max_{j \neq U} \{W_{ij}\}$$

A challenge in measuring the WTP for insurance is that while we want the maximum value of W_{ij} across j options, in CommCare consumers choose plans to maximize $W_{ij} - p_{ij}$. However, we can use choices in CommCare to get bounds on W_i^{Ins}. To do so, note that if someone chooses U in the CommCare setting, it implies that $W_{ij} \leq p_{ij}$ for all $j \neq U$. This in turn implies that

$$\text{Choose } U: \qquad W_i^{Ins} \leq \max_{j \neq U} \{p_{ij}\} \equiv p_i^{max} \tag{7}$$

Thus, p_i^{max} is an upper bound on the value of access to CommCare for people who choose not to buy into it. Similarly, if an individual chooses to take up CommCare, we know that $W_{ij} \geq p_{ij}$ for at least one plan. Therefore, we can bound their W_i^{Ins} from below by the cheapest plan's price:

$$\text{Choose } j \neq U: \qquad W_i^{Ins} \geq \min_{j \neq U} \{p_{ij}\} \equiv p_i^{min} \tag{8}$$

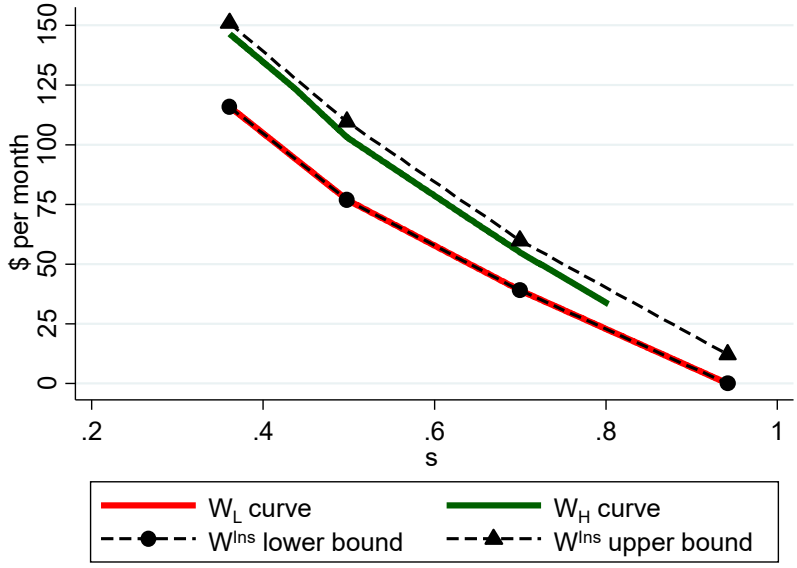
We can now map these bounds into bounds on a W^{Ins} curve. Let s be an index that orders people according to decreasing W_i^{Ins}. Without loss of generality, let the distribution of s be uniform on $[0, 1]$. Let $W^{Ins}(s)$ denote the WTP for insurance for someone with index s (i.e., the $(1 - s)$th quantile of WTP). Suppose that at a given vector of premiums we observe that $1 - s^*$ share of people choose U, while s^* choose formal insurance. For the marginal type s^*, both conditions (8) and (7) hold, so we can say that:

$$p^{min} \leq W^{Ins}(s^*) \leq p^{max}$$

We use this result, along with our variation in premiums, to estimate bounds on the $W^{Ins}(s)$ curve. Specifically, we use the same income discontinuities in premiums discussed above. At each side of the discontinuity, we measure p^{min} and p^{max} and estimate $1 - D_U$. We then plot $1 - D_U$ (as x-values) against the bounds $\{p^{min}, p^{max}\}$ (as y-values) using the points on either side of the discontinuity. As with our estimates of W_L and W_H, we implement this exercise at each income level separately and then shift the curves horizontally to line up with the curve for 150% of FPL.

Appendix Figure 17 shows the resulting bounds for W^{Ins}, with our baseline estimates of W_L

Figure 17: Bounds on Willingness to Pay for CommCare Insurance, 2011



NOTE: Figure shows our estimated bounds for WTP for CommCare (W^{Ins}), whose construction is described in the text of Appendix E. The lower and upper bounds for $W^{Ins}$are shown in black dashed lines (with the point estimates shown in circles and triangles, respectively). For comparison, the graph shows our baseline estimates of W_L (solid red line) and W_H (solid green line) that were derived using the vertical model.

and W_H from the vertical model shown for comparison. The estimated bounds are relatively tight and quite close to the W_L and W_H curves. Indeed, the lower bound on W^{Ins} is identical to W_L by construction; both are generated by plotting the share purchasing formal insurance versus the premium of the cheapest plan (L). The upper bound on W^{Ins} is above W_H, but only slightly higher – a result that does not occur by construction but reflects the fact that the premiums of the H plans are quite similar and that few people choose L. From this exercise, we conclude that our basic estimates of (low) willingness to pay for CommCare insurance are robust to relaxing the vertical model assumptions.

Relaxing the vertical model assumptions for estimating costs is more challenging. Intuitively, our vertical model assumes we can pool the four non-CeltiCare plans into a single composite H option for which a type-s individual has a single expected cost $C_H(s)$. As premiums for H increase slightly, individuals of a single s type (s^*_{HL}) leave the plan, and we can estimate $c_H(s^*_{HL})$ using average costs before and after the change. However, it is also possible that some individuals may switch *among* the plans within H as premiums change. If we weaken the composite plan assumption, this switching could have an independent effect on AC_H and TC_H. In practice, however, we expect any bias to our cost estimates from any switching among H plans to be small. First, there is little reason to expect significant switching, since the premiums of the H plans are nearly identical to each other on both sides of the income thresholds (see Appendix Table 5). Second, given the similarity of $C_H(s)$ and $C_L(s)$ (see Figure 13), it seems unlikely that cost differences among the (much more similar) H plans for a given s type would be large.

Appendix F: Calibration of Individual's Costs if Uninsured

Figure 18 compares individual's willingness to pay (W_H) not only to the cost to the insurer (C_H) but also to estimates of the cost the individual would pay if they were uninsured, which we denote by C_U^{OOP}.

To construct C_U^{OOP}, we proceed in two steps. First, we construct a cost curve that is adjusted for moral hazard, $C_H^{NoMH}(s) \equiv \frac{C_H(s)}{1+\phi}$, where $\phi = 25\%$ assumes that having health insurance increases costs by 25%.[45] This is denoted in Figure 18 by $C_H^{NoMH}(s)$. Second, we multiply by the percentage of medical costs, p, that uninsured individuals pay for medical care. The resulting cost curves $C_U^{OOP}(s) = p \cdot \frac{C_H(s)}{1+\phi}$, reflects the expected cost that a type s would pay out-of-pocket if uninsured – which is lower than the expected cost $C_H(s)$ imposed on the insurer. Figure 18 shows the resulting cost curve for $p = 20\%$, motivated by estimates from existing literature (Coughlin et al. 2014; Hadley et al. 2008; Finkelstein, Hendren, and Luttmer, 2015).

The expected out-of-pocket costs of the uninsured (C_U^{OOP}) is much more comparable to willingness to pay and consistent with WTP reflecting out-of-pocket costs if uninsured plus a risk premium, as would be implied by a neoclassical model of insurance. However, strong conclusions from this calculation should be taken with caution, as it requires two parameters (p and ϕ) that are uncertain and are not directly estimated in our setting.

Appendix G: Heterogeneity Analysis

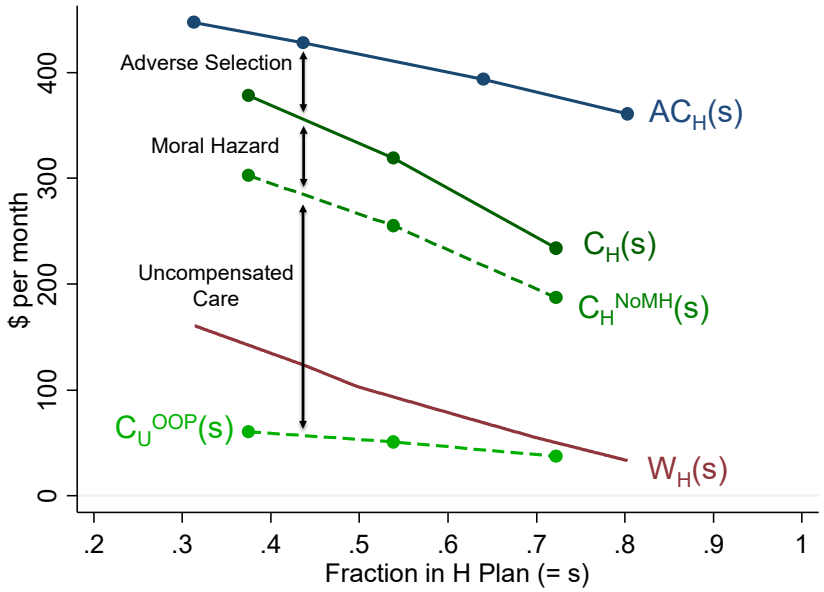
We explore several dimensions of possible heterogeneity in willingness to pay and the gap between willingness to pay and insurer costs. First, we show that willingness to pay is lower – and the gap between willingness to pay and insurer costs is larger – for individuals who live closer to safety net providers. This is consistent with a role for access to uncompensated care in reducing willingness to pay, although naturally there may be other differences across areas that could explain the findings.

Second, we show that willingness to pay is lower – and the gap between willingness to pay and insurer costs is larger – for lower income individuals. This is consistent with behavioral biases that are larger for lower income individuals and/or greater access to uncompensated care by lower income individuals. Again, of course, an important caveat is that individuals who vary in income may vary in other ways that could separately explain these findings.

Variation by Proximity to Safety Net Providers We analyze how willingness to pay and costs vary with physical proximity to safety net providers. Certain providers have a reputation for generosity towards poor uninsured patients – notably, Community Health Centers (CHCs) and certain "safety net" hospitals, the largest of which in Massachusetts is Boston Medical Center (BMC). We therefore analyze WTP and costs for subgroups of enrollees based on their location of residence relative to these providers.

[45] In Section 5 we discuss two independent back of the envelope calculations that suggest that this is a reasonable approximation for the moral hazard effects of CommCare coverage for previously uninsured individuals. One is based on estimates of impacts of copays in CommCare on health care spending from Chandra et al. (2014), and one is based on impacts of Medicaid on healthcare spending in the Oregon Health Insurance Experiment from Finkelstein et al. (2012)).

Figure 18: Calibration: Cost Curve Adjusted for Moral Hazard and Uncompensated Care



NOTE: Figure reproduces $W_H(s)$, $AC_H(s)$ and $C_H(s)$ curves from figure 13. In addition, it shows results of a back-of-the-envelope calibration showing the role of moral hazard and uncompensated care. Adverse selection reflects the gap between the average cost (AC_H) and cost of marginal enrollees (C_H). Moral hazard reflects the effect of insurance to increase utilization (which we assume to be about 25%); the cost curve without moral hazard is denoted $C_H^{NoMH}(s)$. Uncompensated care reflects the share of health care costs incurred by the uninsured covered by third parties, assumed to be 80%; the resulting expected out-of-pocket costs of the uninsured is denoted $C_U^{OOP}(s)$.

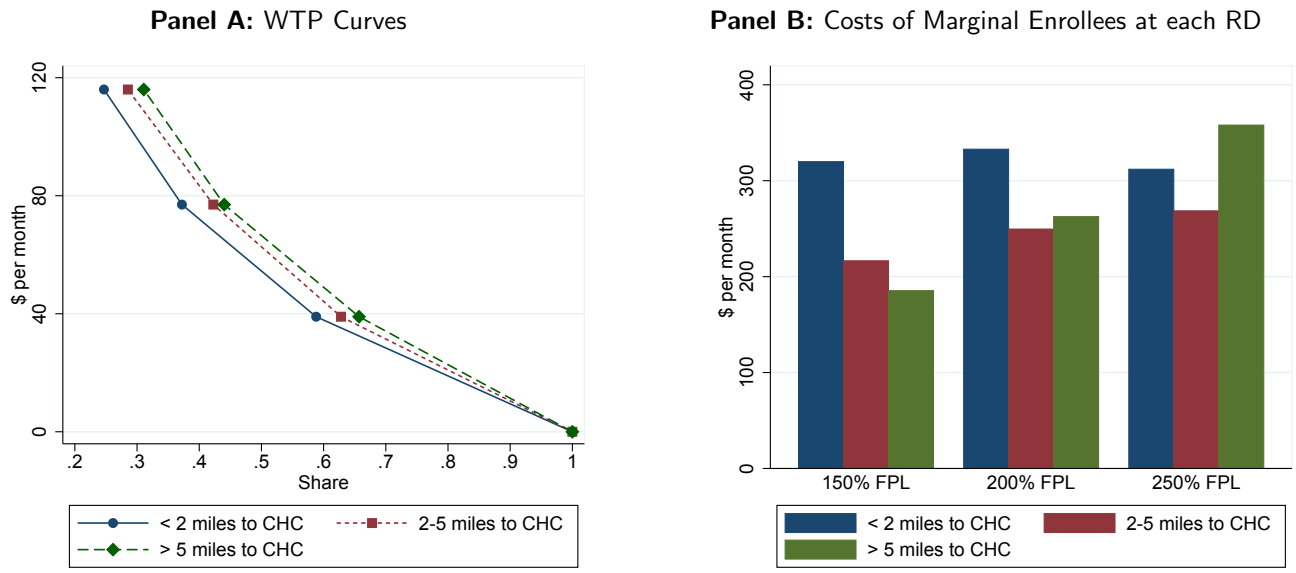
We identify CHCs in Massachusetts using a provider network list posted by the CommCare exchange for 2013.[46] We code enrollee distance to the nearest CHC using Google Maps driving distance from the centroid of their zip code of residence to the CHC's zip code. About 33% of our sample lives within 2 miles of a CHC, and another 27% live within 2-5 miles. We also analyze the data for Boston-area residents based on proximity to Boston Medical Center (BMC) or one of its affiliated CHCs. Specifically, we define 13 zip codes containing these BMC providers (and one adjacent zip code) as "nearby BMC" and analyze these versus other zip codes in the Boston area, defined as within 10 miles of the city center.[47]

Because power is a concern (especially for costs), we implement our RD analysis on the pooled 2009-13 dataset. We report two sets of analyses. First, we run enrollment count RD regressions (analogous to Figure 5) and calculate the percent decrease in enrollment at each of the income thresholds. A larger fall in enrollment indicates a more elastic (flatter) WTP curve. To visualize the resulting WTP curves, we normalize share enrolled to be 1.0 when insurance is free (just below 150% of FPL) and compute subsequent shares by sequentially scaling down by the percent change in enrollment at each

[46] We are happy to share this list on request. A slightly more recent (but nearly identical) list for 2015 is available at the Connector's website: https://betterhealthconnector.com/wp-content/uploads/ConnectorCare-2015-Hospital-CHC-List.pdf

[47] Specifically, the zip codes defined as "nearby BMC" are 02118, 02119, 02120, 02121, 02122, 02124, 02125, 02126, 02127, 02128, 02130, 02131, 02210. These zip codes approximately extend from East Boston and South Boston down to Roxbury, Dorchester, and Mattapan.

Figure 19: Variation by Proximity to a Community Health Center



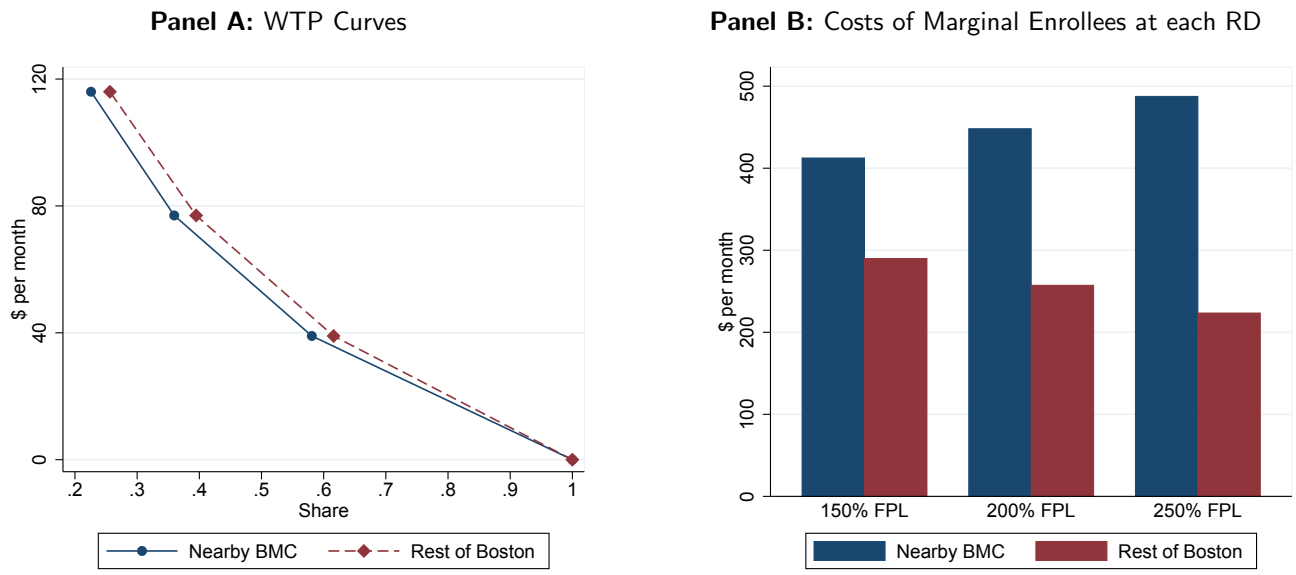
NOTE: The figure shows WTP curves (panel A) and marginal enrollees' costs (panel B) for different subgroups of enrollees based on their proximity of their residence to a Community Health Center in Massachusetts. All analyses are based on pooled 2009-2013 data. As discussed in text, the WTP curve is constructed using RD estimates of the percent change in enrollment at each income threshold where premiums increase. The cost estimates are calculated using RD estimates of average costs and the enrollment change.

RD. We plot these shares against the premiums they correspond to. The results are shown in panel A of Figures 19 and 20. In both cases, the WTP curves are modestly more elastic – i.e., enrollment falls more at each premium increase – for enrollees living closer to either CHCs or Boston Medical Center.

For our second analysis, we report marginal costs for people who drop insurance at each of our RD income thresholds – calculated from average cost RDs and the percent change in enrollment. Because WTP for the marginal enrollees is by definition fixed (it lies between the lower and higher premium), higher marginal costs for a subgroup indicates a larger gap between WTP and costs. Panel B of Figures 19 and 20 show these cost estimates at each income RD. For CHCs, at two of three thresholds, costs are higher for people living within 2 miles of a CHC, though the reverse is true for the 250% FPL threshold. For proximity to BMC, the cost differences are much larger and more consistent; marginal enrollees living nearby BMC have higher costs by at least +30% at every threshold.

Variation by Income We also examine how our demand and cost estimates vary by income. We use the fact that our regression discontinuities give us estimates of willingness to pay and average cost curves for three income groups, 150%, 200% and 250% of poverty. In our main analysis, we shifted these groups' line segments to align with 150% of poverty (see Figures 10 and 12 for a visualization). It is straightforward to implement this same method but instead align everything with 200% or 250% of FPL. Figure 21 shows the results. It shows that the 150% FPL group has the lowest WTP and highest cost, and therefore the biggest gap between WTP and costs. This gap shrinks for higher-income groups. This pattern holds outside our sample too: our finding of willingness to pay below

Figure 20: Variation by Proximity to Largest Safety Net Hospital (BMC)



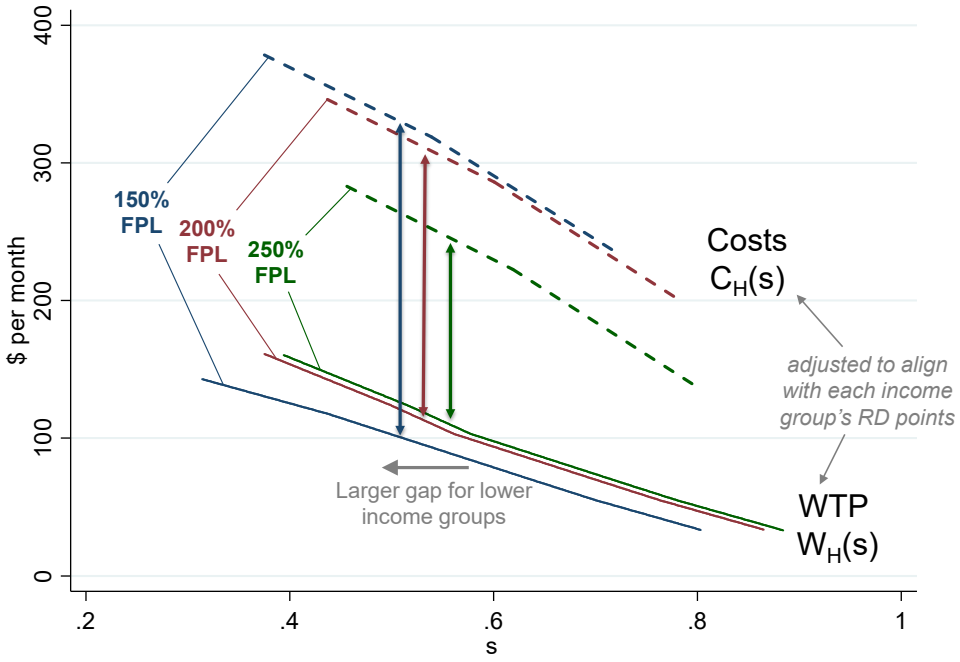
NOTE: The figure shows WTP curves (panel A) and marginal enrollees' costs (panel B) for different subgroups of enrollees based on their proximity of their residence to Boston Medical Center (the largest safety net hospital in MA) or its affiliated health centers. The analysis is restricted to people living in the Boston area, defined as within 10 miles of the city center. All analyses are based on pooled 2009-2013 data. As discussed in text, the WTP curve is constructed using RD estimates of the percent change in enrollment at each income threshold where premiums increase. The cost estimates are calculated using RD estimates of average costs and the enrollment change.

insurer costs for the low-income population in Massachusetts contrasts with Hackmann, Kolstad, and Kowalski (2015)'s estimate that higher-income individuals in Massachusetts (above 300% of FPL) are willing to pay the cost they impose on the insurer.

Both behavioral biases and access to uncompensated care may play a larger role for lower income populations. Behavioral biases may be particularly acute among low-income populations who may be making purchase decisions under greater constraints or stress (Mani et al. (2013); Mullainathan and Shafir (2014); Bhargava et al. (2017)). Lower-income individuals also typically have access to more uncompensated care – both from ex-ante charitable providers and from ex-post bad debt – than higher income individuals (e.g. (Mahoney, 2015; Dranove et al., 2015)). In addition, non-profit hospitals typically have explicit policies that they will give free or discounted care to uninsured patients with incomes below certain thresholds (often around 150-200% of FPL).

Consistent with lower-income groups having more access to uncompensated care, in our data it appears that lower-income marginal enrollees tend to use types of healthcare that is more "amenable" to uncompensated care than higher income marginal enrollees. To see this, we decompose the costs of marginal enrollees at each of our three income RD thresholds. Different types of health care vary in how "amenable" they are to uncompensated care – i.e., how likely uninsured patients can access them at free or discounted fees. Using our underlying claims data, we decomposed claims into categories based on our sense of how amenable they are to uncompensated care. Guided in part by reports like Coughlin et al. (2014) that characterize the nature of uncompensated care, we grouped the data

Figure 21: WTP and Cost Curves, adjusted to different income levels



NOTE: These graphs show the adjusted WTP (W_H, solid lines) and cost curves (C_H, dashed lines) calculated by adjusting curves to line up with each income group's RD points. Each curve is shown over its in-sample range (no extrapolation).

into the following five categories, in roughly descending order of uncompensated care amenability: (1) hospital emergency care (including ER care and inpatient admissions originating in the ER), (2) non-emergency care (both inpatient and outpatient) provided at a safety net hospital or Community Health Center,[48] (3) non-emergency care provided at other (non-safety net) hospitals, (4) outpatient physician care, and (5) prescription drugs and all other care (where drugs are about 2/3 of this category). Our sense is that categories 1 and 2 are more amenable to uncompensated care, while the remaining categories are less so. For each category, we computed average costs in each income bin and ran RD regressions on the pooled 2009-13 data similar to our main analysis. We used the average cost values just below and above each discontinuity, along with the change in enrollment at the threshold, to calculate costs of the marginal enrollees who drop out when premiums increase.

Figure 22 shows the resulting estimates. The three bars show costs of marginal enrollees at 150%, 200%, and 250% FPL (in reverse order). Next to each bar we show the range of WTP for the marginal population (i.e., the premium below and above each threshold). The results indicate that lower-income (and lower-WTP) groups have a larger share of their costs in more amenable categories. For instance, emergency and safety net care (the green segments) comprise 57% of costs for marginal enrollees at 150% of FPL (whose WTP is between $0-39) versus 39% of costs at 250% of FPL (whose WTP is between $77-116). Most of the increment in costs for the 250% FPL vs. 150% FPL marginal enrollees comes from growth in less amenable (orange) categories.

Appendix H: Approximating the Moral Hazard Effects of CommCare coverage for the low-income uninsured

We translate the estimates of moral hazard in CommCare from Chandra et al. (2014) into an estimate we can use to estimate the impact of insurance coverage on utilization. Chandra et al. (2014)study healthcare spending for the low-income adult population in MA's CommCare from 2007-2009; it is thus the same population we study here, although from an earlier time period. They study an increase in co-payments during this period. Based on this, they estimate that a 1% increase in out of pocket costs causes a 0.16% reduction in total spending. We translate this into an estimate of what Commcare coverage does to healthcare spending.

To do so, let m denote spending and x denote out-of-pocket payments (which, in their model, is only copayments). Assume

$$x = pm$$

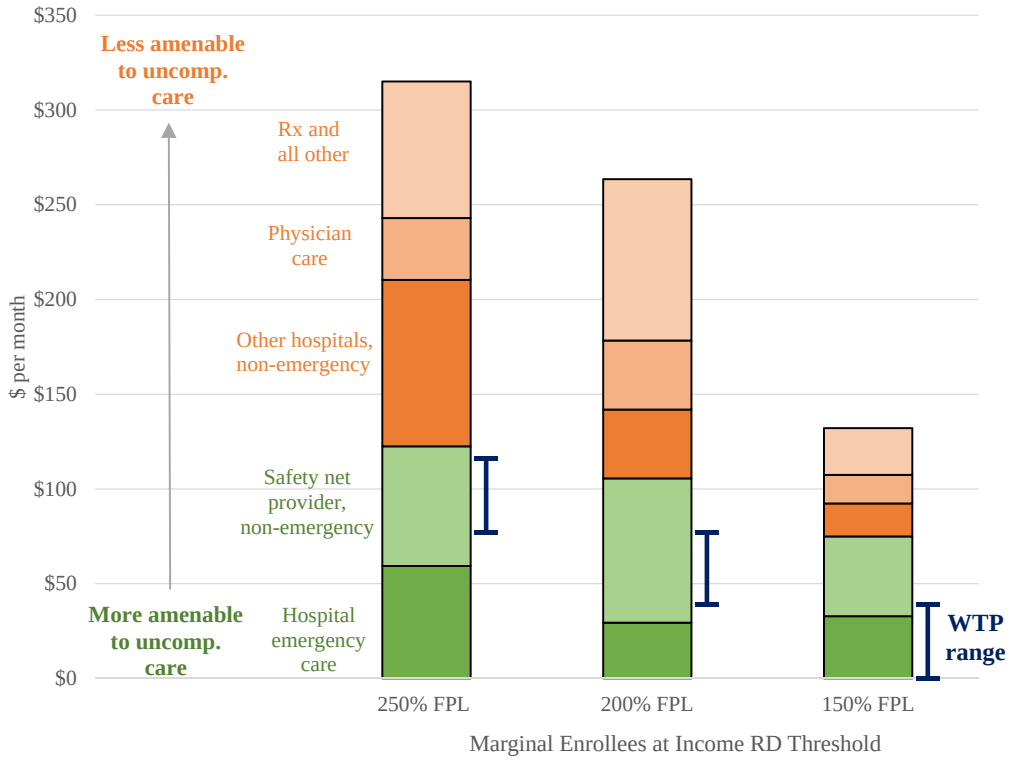
where $p = \frac{x}{m}$ is the co-insurance rate. We want to know how m changes when we change p, $\frac{dm}{dp}$ or $\frac{dlog(m)}{dp}$. But, what Chandra et al. (2014) report from their regression is how m changes with x. In particular, they report:

$$log\,(m) = \alpha + \beta log\,(x) + \epsilon$$

and they estimate $\beta = 0.16$.

[48] Following a categorization defined by Massachusetts' Center for Health Information and Analysis, we defined "safety net hospitals" as hospitals with a high share of patients who are uninsured or covered by public payers.

Figure 22: Breakdown of Costs of Marginal Enrollees



NOTE: The graph shows a decomposition of costs of marginal enrollees at each of our three income thresholds (150%, 200%, and 250% FPL) where premiums increase. Costs are broken down into five categories, roughly based on how "amenable" they are to being delivered to the uninsured as uncompensated care. More amenable categories are hospital emergency care and safety net provider non-emergency care (labeled on the graph and shown in green); less amenable categories are other hospital non-emergency care, physician care, and Rx/all other (shown in orange). The bars indicate the range of WTP for marginal enrollees at each income threshold. All analysis is based on the pooled 2009-2013 data.

Note that:

$$\beta = -0.16 = \frac{dlog\left(m\right)}{dlog\left(x\right)} = \frac{dm}{m}\frac{x}{dx} = p\frac{dm}{dx}$$

Now,

$$dlog\left(p\right) = dlog\left(x\right) - dlog\left(m\right)$$

So,

$$\frac{dlog\left(m\right)}{dlog(p)} = \frac{1}{\left[\frac{dlog(x)}{dlog(m)} - 1\right]}$$

or

$$\frac{dlog(m)}{dp} = \frac{1}{p}\frac{1}{\left[\frac{dlog(x)}{dlog(m)} - 1\right]}.$$

Therefore, we can plug in our estimate for $\frac{dlog(x)}{dlog(m)} = \frac{1}{\beta}$ and yield

$$\frac{dlog\left(m\right)}{dp} = \frac{-1}{p\left[1 - \frac{1}{\beta}\right]}$$

So, if $p = 20\%$ (i.e. CommCare corresponds to a 20 percentage point reduction in costs for the insured (because uninsured pay 20% of their costs) and $\beta = -0.16$ we have

$$\frac{dlog\left(m\right)}{dp} = \frac{-1}{.2 * 7.25} = .69$$

So, taking prices from 0.2 to 0 implies a 13.8% (=0.69*.2) reduction in out of pocket spending. Taking a higher price paid by uninsured of 35% implies a 24.2% reduction in prices.

Appendix I: Willingness to Pay Behind the Veil of Ignorance

One potential concern with comparing willingness to pay to costs is that demand is measured after some information about health risk may potentially have been revealed to the individual. For example, suppose demand is measured after one learns whether or not she has a chronic condition. In this case, observed demand will understate the *ex-ante* value of insurance that would be measured before the individual has learned their risk. Hendren (2017) provides a method for calculating willingness to pay for insurance from behind the veil of ignorance. Instead of using the observed market demand curve, $W\left(s\right)$, one uses an "*ex-ante*" demand curve, $W\left(s\right) + EA\left(s\right)$, where $EA\left(s\right)$ captures the value of expanding the size of the insurance market from the perspective of behind the veil of ignorance.

For a linear demand curve, the formula in Hendren (2017) for the *ex-ante* component of willingness to pay is given by $EA\left(s\right) = \left(1 - s\right)\left(C\left(s\right) - W(s) - sW'\left(s\right)\right)\gamma\frac{1-s}{2}\left(12 * W'\left(s\right)\right)$ where γ is the coefficient of absolute risk aversion and the factor of 12 translates our monthly demand estimates into yearly units. We apply this formula in our context using a conservatively high coefficient of absolute risk aversion of $5x10^{-4}$ (which corresponds to a coefficient of relative risk aversion of 5 if individuals have \$10,000 of annual consumption). Our estimates suggest that even using an *ex-ante* demand measure

and a high value of γ, willingness to pay would still be below own cost. For example, at $s = 0.50$ we estimate that the marginal welfare impact from behind the veil of ignorance of expanding the size of the insurance market is roughly $EA\left(0.5\right) = 0.5\left(333 - 103 - 0.5 * (-239)\right) 0.0005 * \frac{0.5}{2} * 12 * (-239) = \$63$ higher (i.e., \$163 instead of \$100) than the marginal welfare impact implied by observed demand. Although non-trivial, this is small relative to the approximately \$300 difference between marginal cost and observed demand at $s = 0.5$. The intuition for this is that the "risk" of learning that one is a high risk type and must purchase insurance is not exceedingly large when premiums are already heavily subsidized.

Appendix J: Additional Tables and Figures

We present additional results referenced in the text here. We briefly provide some additional discussion of a few of them.

First, Appendix Figure 23 shows changes in average age of enrollees at the premium discontinuities. The estimated changes in average age are (not surprisingly) more precise than the estimated changes in average costs (Figure 5). An interesting question is how much of the adverse selection observed in Figure 5 is in fact driven by age. Our calculation suggests that age differences can explain only about one-fifth of average cost differences at 150% of poverty, and about one-eighth of cost differences at 200% of poverty. To do this calculation we used the 2009-2013 data to project insurer costs on age (using single year of age dummies). We then used the resulting estimates of expected costs (as a function of age) as the outcome variable in our standard regression discontinuity analysis. We interpret this RD analysis with projected costs as the outcome variable compared to the RD analysis with actual costs as the outcome variable as informing us about the share of adverse selection that can be explained by age.

Second, Appendix Figure 25 shows plan enrollment discontinuities separately by year. In the pooled 2009-2013 data (Panel A of Figure 5) we saw some slight evidence of lower enrollment (relative to the linear slope in income that we fit) to the right of the thresholds. Here, we show results separately by year. The limited bunching (i.e. slightly lower-than-projected enrollment to the right of the threshold) in the pooled figure appears to be driven entirely by 2012 and 2013. This in turn appears to be driven by an annual administrative inflation update to the FPL measure, rather than strategic manipulation by enrollees. Each year in March or April, the state updated the FPL used for calculating income/FPL (our running variable) to reflect the revised HHS value. Because incomes are recorded in nominal terms, a higher FPL automatically reduced incomes as a % of FPL. However, the state only immediately updated the administrative income/FPL variable when it made a difference for subsidies – i.e., when it moved people from just above to just below 150%, 200%, or 250% of FPL. In other cases, they waited for annual income audits to update the income/FPL variable. This administrative update therefore mimics strategic bunching. Consistent with this explanation, in results not shown, we found a sharp increase in bunching among current enrollees in March-April of 2012 and 2013, which fades away to nil over the rest of the year (as other enrollees' incomes are audited and updated). We see no evidence of bunching among new enrollees (whose income is newly reported so

Table 5: Premiums by CommCare Plan

CommCare Plan	H / L Plan	Insurer Price (pre-subsidy)	Enrollee Premium (post-subsidy) by Income Group (% of FPL)			
			100-150%	150-200%	200-250%	250-300%
BMC HealthNet	H	$425	$11	$57	$105	$146
Fallon	H	$426	$12	$60	$110	$151
Neighborhood Health Plan (NHP)	H	$426	$12	$60	$110	$151
Network Health	H	$423	$10	$57	$105	$146
CeltiCare	L	$405	$0	$39	$77	$116

NOTE: The table shows enrollee premiums (by income group range) for each CommCare insurer in the market in fiscal year 2011. The top four plans – which we pool into an "*H*" plan in our analysis – all have very similar premiums because their (pre-subsidy) price bids were nearly identical, having been constrained by a binding price ceiling.

not affected by this policy) in *any* year, including 2012 and 2013. Finally, this administrative update does not affect the data in 2009-2011 for a simple reason: there was no inflation update to the FPL in 2009 or 2010, and the inflation update in 2011 was very small (+0.6%, vs. +2.6-2.9% in 2012-13). We thank Michael Norton of the Connector for alerting us to this policy and helping us reconcile our findings with it.

Table 6: Summary of Estimates, 2011

Variable	150% FPL			200% FPL			250% FPL		
	Below	Above	Δ	Below	Above	Δ	Below	Above	Δ
Sticker Premium (Monthly)									
P_U (Expected)	$9.5		--	$28.5		--	$48.0		--
P_L	$0.0	$39.0	+$39	$39.0	$77.0	+$38	$77.0	$116.0	+$39
P_H	$11.0	$57.9	+$47	$57.9	$106.3	+$48	$106.3	$147.3	+$41
P_H - P_L	$11.0	$18.9	+$8	$18.9	$29.3	+$10	$29.3	$31.3	+$2
Normalized Premium (Monthly)									
P_L	-$9.5	$29.5	+$39	$10.5	$48.5	+$38	$29.0	$68.0	+$39
P_H	$1.5	$48.4	+$47	$29.4	$77.8	+$48	$58.3	$99.3	+$41
Market Shares									
Any Insurance	0.94	0.70	-0.24	0.76	0.56	-0.20	0.58	0.44	-0.14
H Plan	0.80	0.64	-0.16	0.70	0.50	-0.20	0.52	0.39	-0.12
L Plan	0.14	0.06	-0.08	0.06	0.06	0.00	0.06	0.05	-0.01
Average Cost (Monthly)									
Any Insurance	$333	$380	+$47	$355	$386	+$31	$328	$343	+$15
H Plan	$361	$393	+$32	$371	$405	+$35	$345	$365	+$20
L Plan	$169	$242	+$73	$170	$225	+$55	$175	$153	-$22

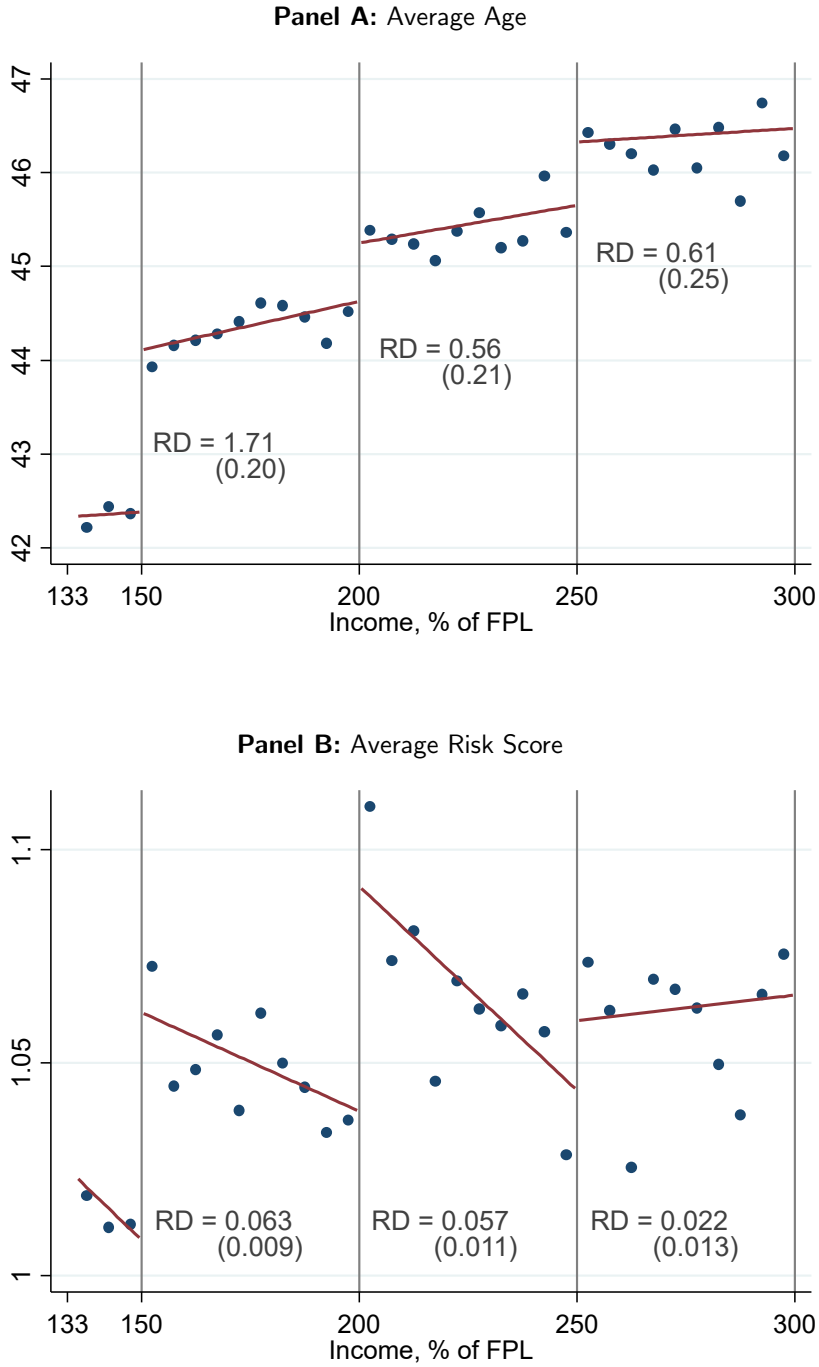
NOTE: This table summarizes the inputs into our estimates of willingness to pay and cost curves. For each income threshold at which premiums change, table shows the monthly enrollee premium, estimated market share, and average monthly insurer costs just below and above the threshold, as well as the change across the threshold. The premiums reported in the first two panels were previously presented in Figure 3. The first panel shows sticker premiums for U (the expected mandate penalty), the L plan, H plan, and the difference $p_H - p_L$; we use these for our main demand estimates. The second panel shows "normalized" premiums, where p_U has been normalized to $0, which we use for robustness analysis. The third and fourth panels report changes in market shares and average insurer costs based on RD estimates of equation (1); these results for any insurance and H plan were previously shown in the main text in Figures (7) and (8), respectively. The results for the L plan are in Appendix Figure 24.

Table 7: Willingness to Pay and Costs ($ per month)

Point in WTP Distribution		WTP		Costs	
		$W_L(s)$	$W_H(s)$	$C_H(s)$	$AC_H(s)$
Min In-Sample	(s = 0.94)	$0	$5	$148	$334
20th Percentile	(s = 0.80)	$23	$34	$203	$362
40th Percentile	(s = 0.60)	$58	$79	$291	$400
Median	(s = 0.50)	$77	$103	$333	$417
60th Percentile	(s = 0.40)	$105	$135	$369	$434
Max In-Sample	(s = 0.31)	$131	$162	$399	$448

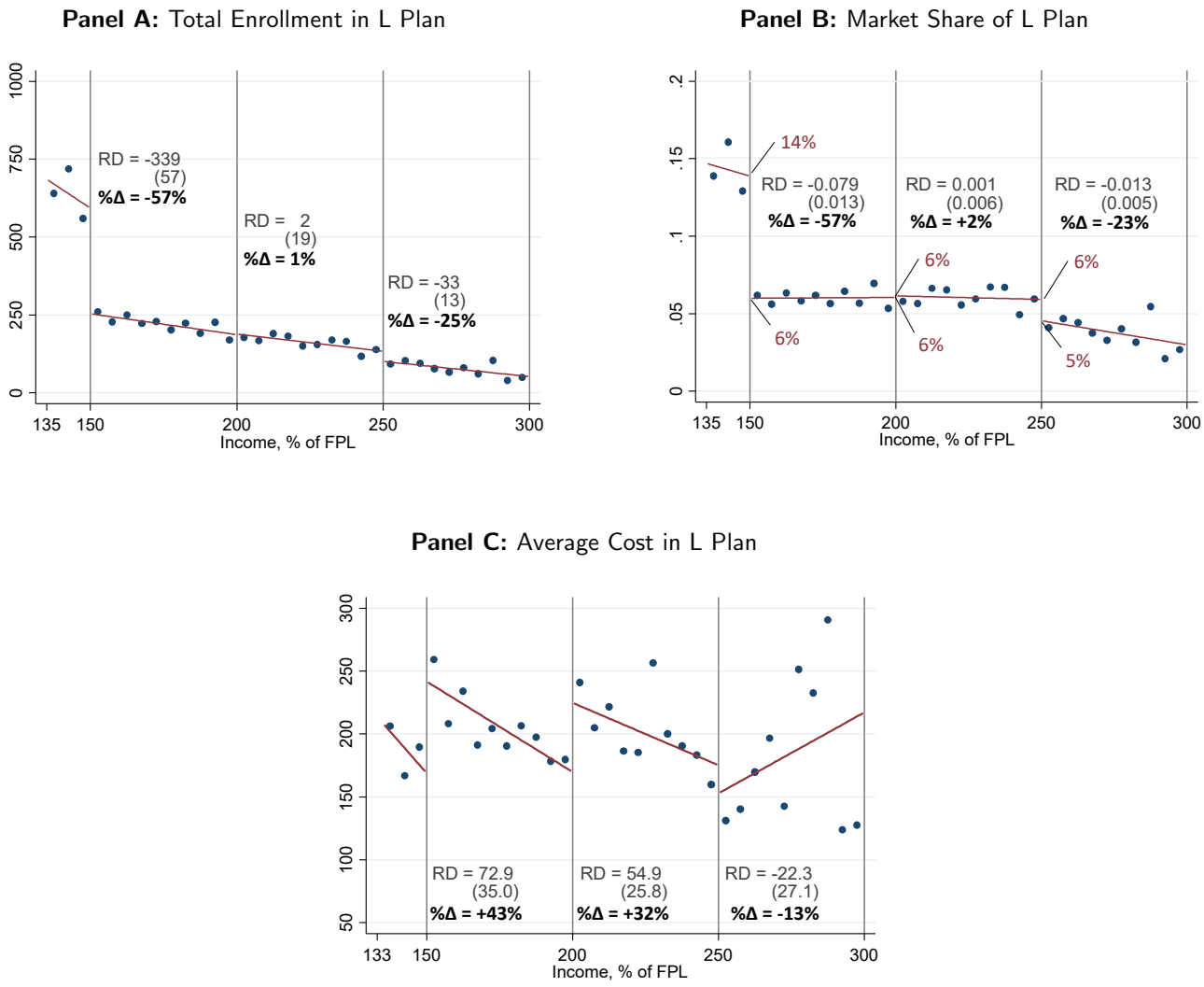
NOTE: Table summarizes our estimates of willingness to pay and costs for individuals at 150 percent of the FPL shown in Figure 13.

Figure 23: RD for Age and Risk Scores for Enrollees in All Plans, 2009-2013



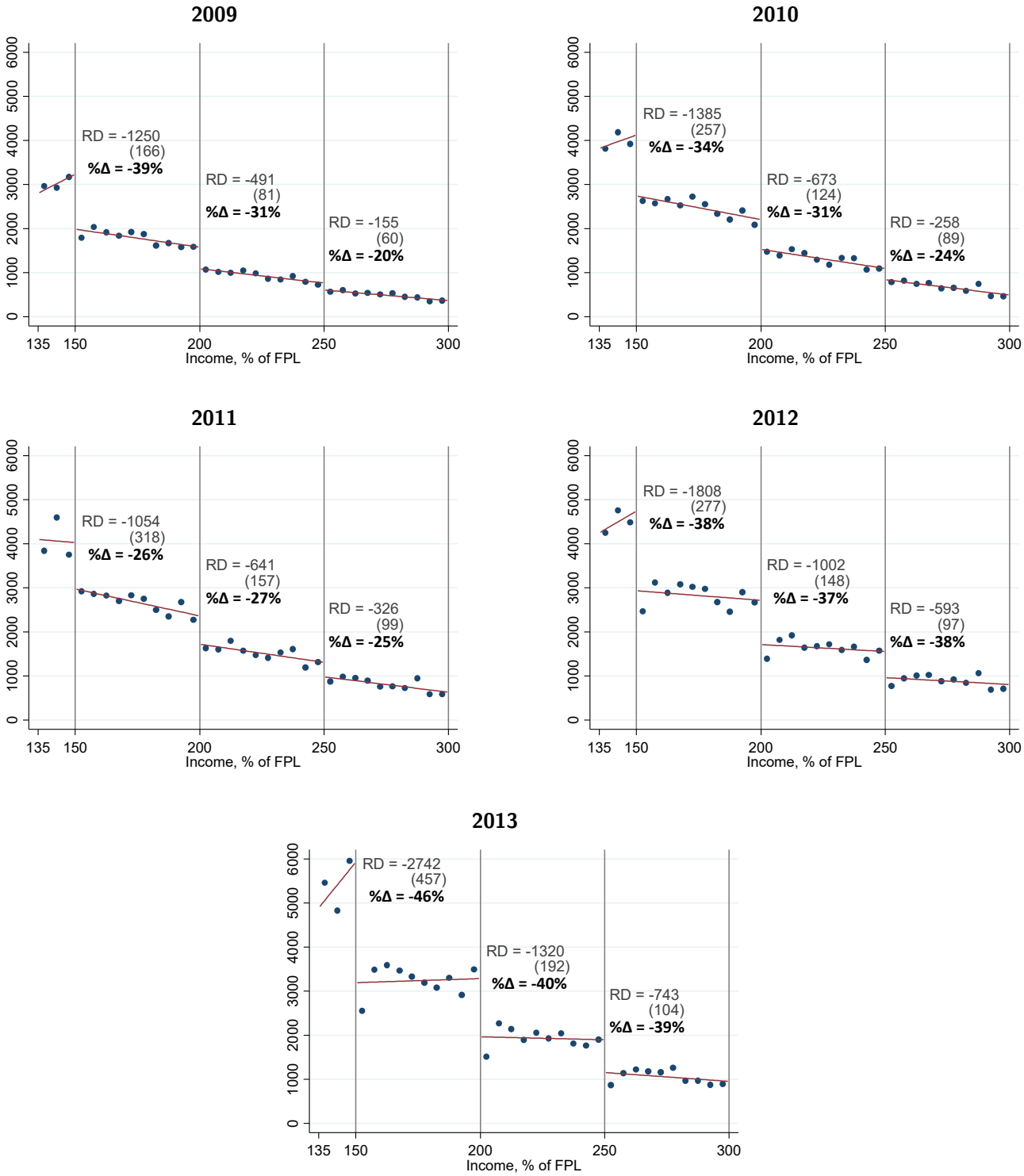
NOTE: These graphs show RD estimates for the average age (panel A) and risk score (panel B) of CommCare enrollees in all plans, pooled over the 2009-2013 period of our data. Risk scores are calculated by CommCare to reflect a person's expected medical spending based on their age, sex, and medical diagnoses. They are used by CommCare to adjust payments to insurers for their enrollees. Risk score values are relative to an average enrollee (whose risk score is 1.0) – e.g., a risk score of 1.05 indicates expected costs 5% above average.

Figure 24: RD Estimates for L Plan, 2011



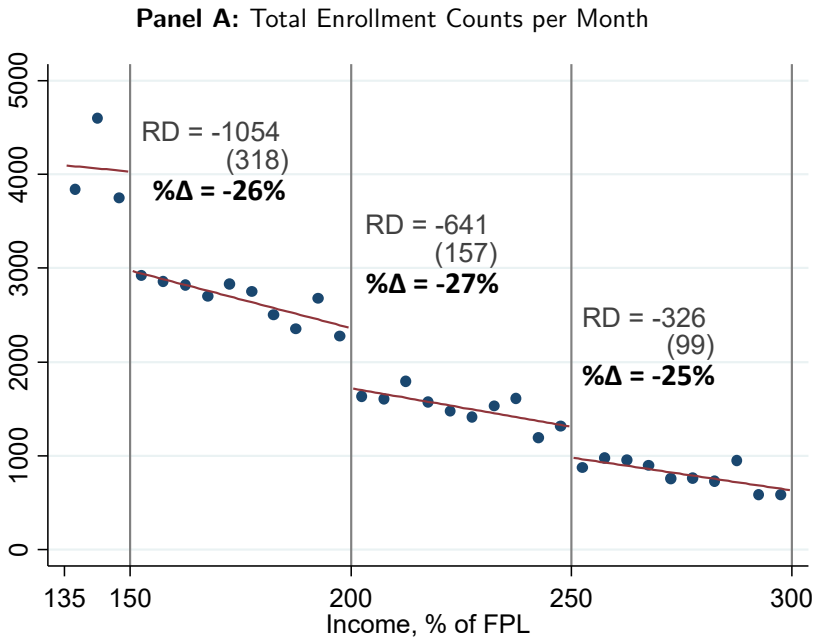
NOTE: Figures show our RD estimates for total enrollment, market shares, and average costs for the L plan in 2011, analogous to the estimates for all plans and the H plan in Figures 6-8 of the main text.

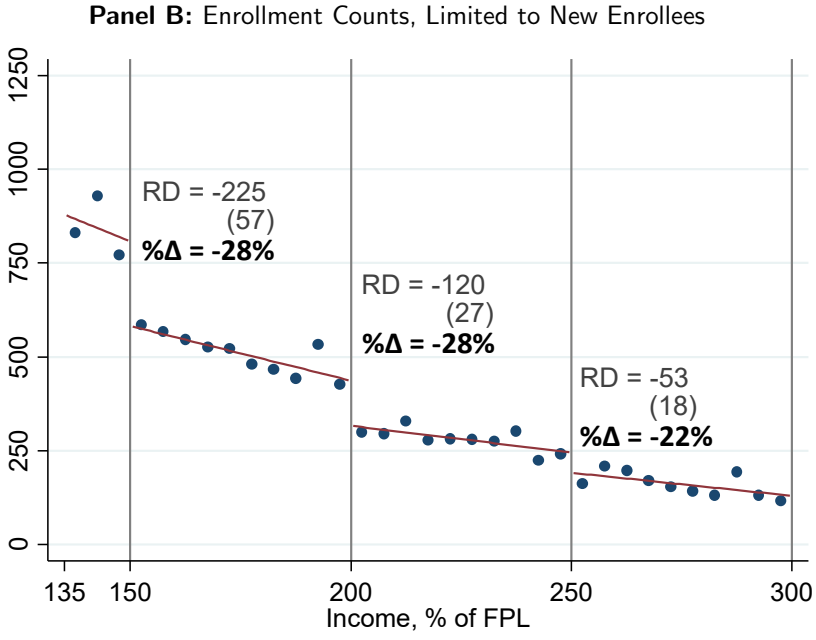
Figure 25: Total Enrollment Counts in CommCare, by Year



NOTE: The graph shows our baseline regression discontinuity analysis for total enrollment counts per month from Figure (5), Panel A (which showed results pooled for 2009-2013). Here, we show results separately by year.

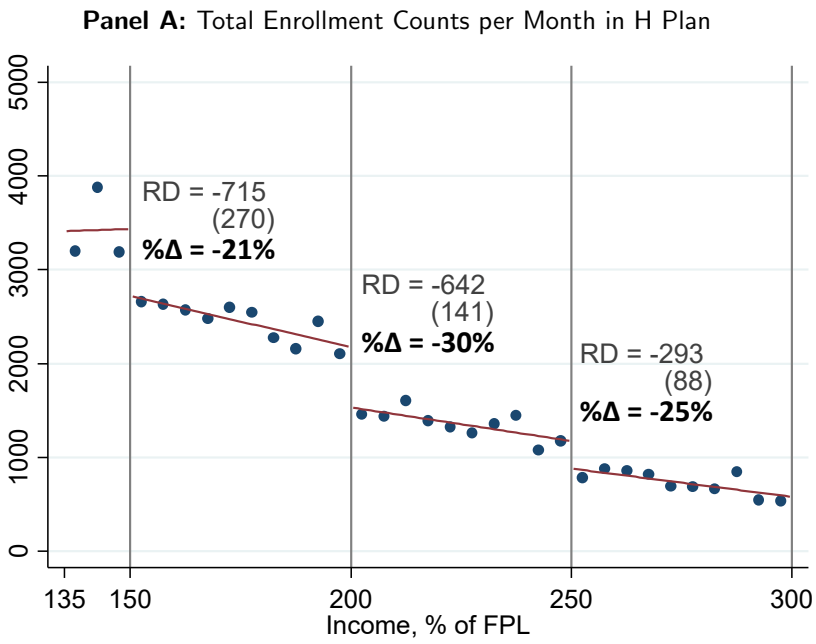
Figure 26: Enrollment Counts in 2011, by Income

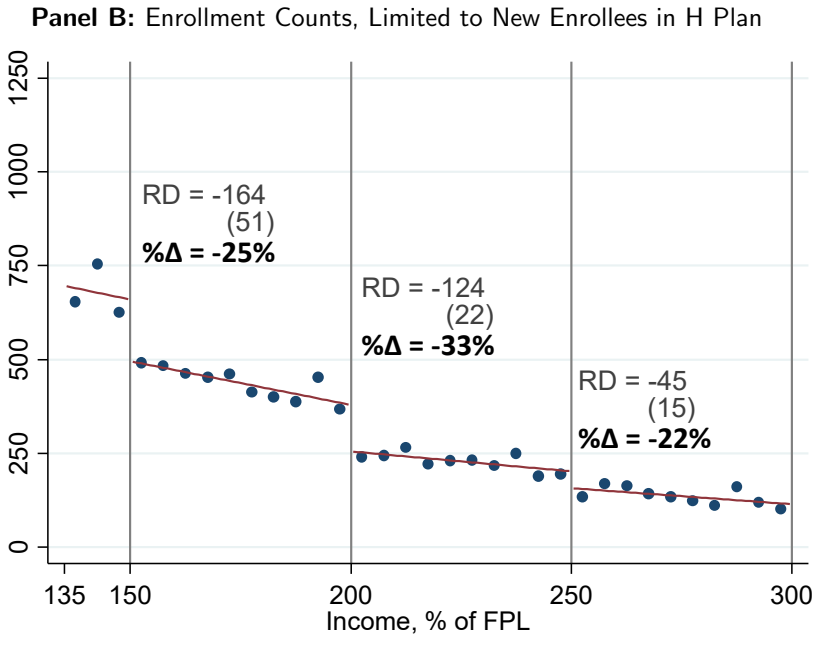




NOTE: These graphs are identical to Figure 25 but applied to counts of enrollees, but Panel B is limited to just new enrollees in CommCare during 2011.

Figure 27: Enrollment Counts in 2011 for H Plan, by Income





NOTE: These graphs are identical to Figure 26 but applied to counts of enrollees in the H plan only.