

Addressing Affordability in the National Flood Insurance Program

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There is often tension between setting insurance premiums that reflect risk and dealing with equity/affordability issues. The National Flood Insurance Program in the United States recently moved toward elimination of certain premium discounts, but this raised issues with respect to the affordability of coverage for homeowners in flood-prone areas. Ultimately, Congress reversed course and reinstated discounted rates for certain classes of policyholders. We examine the tension between risk-based rates and affordability through a case study of Ocean County, New Jersey, an area heavily damaged by Hurricane Sandy. We argue that the NFIP must address affordability, but that this should not be done through discounted premiums. Instead, we propose a means-tested voucher program coupled with a loan program for investments in hazard mitigation.

Keywords: National Flood Insurance Program; affordability; risk-based premiums; Ocean County; New Jersey; Hurricane (Superstorm) Sandy.

1. Introduction

Low-probability, high-consequence events are costly to insure. The spatial correlation of disaster losses often requires private insurers to set high premiums to cover potential claim payments, cost of capital, and administrative/marketing costs

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(Kunreuther and Michel-Kerjan 2011). This has led to an ongoing tension between homeowners with properties in hazard-prone areas who complain that they cannot afford the insurance premiums that they are being charged, and private insurers' need to price catastrophic lines of coverage at premiums that allow them to profitably underwrite the risk. In response, many federal governments such as the U.S. and France have offered discounted or cross-subsidized insurance policies for property in hazard-prone areas (OECD 2008).

For government programs, the tension remains between premiums reflecting risk to avoid deficits, and the high costs of insurance for properties in high hazard areas. This has been a topic of discussion and debate in recent years with respect to the United States' National Flood Insurance Program (NFIP). The NFIP, housed within the Federal Emergency Management Agency (FEMA), offers flood insurance to residents and businesses in participating communities. Since Hurricane Katrina in 2005, the NFIP has been in debt billions of dollars (USD) to the U.S. Treasury. In July 2012, President Obama signed the Biggert–Waters Flood Insurance Reform Act (henceforth BW12), which passed Congress with overwhelming bipartisan support. The bill recognized that insurance premiums should reflect risk and took steps to implement this principle so as to put the NFIP on a more financially sound basis. As higher premiums began to be phased in for some properties around the United States, many legislators wavered in their commitment to risk-based pricing for flood insurance given concerns raised by many of their constituents that they would not be able to afford coverage and/or that they were being treated unfairly. In response, the Homeowner Flood Insurance Affordability Act of 2014 (henceforth HFIAA14), passed Congress with substantial support from both the House and Senate and was signed by the President in March 2014. The legislation eliminates or delays the implementation of many of the rate changes made in BW12.

This paper examines the current tension in the U.S. over risk-based premiums and issues of affordability of flood coverage.¹ We measure affordability by first specifying the maximum percentage of a household's income that would be deemed reasonable to allocate to flood insurance and translating this percentage into a maximum insurance premium (P^*) that a household could be expected to pay with its own funds. If the actual insurance premium exceeded P^* , then this household would be classified as needing some type of assistance. For example, if

¹The policies that are unfolding around this issue, while specific to U.S. flood insurance, offer lessons for other countries such as the United Kingdom (UK) and other lines of insurance in the U.S. such as state wind pools in Florida and Texas and the California Earthquake Authority that are currently facing similar challenges.

a household's income were \$50,000 and the maximum percentage of income were 5 percent, then if the actual premium exceeded \$2,500, this household would be deemed eligible for some type of assistance.

Ocean County, New Jersey serves as a detailed case example for analyzing recent changes to the NFIP and the legislation's impact on affordability of insurance coverage for homeowners. The area was heavily damaged by Hurricane Sandy; FEMA is in the process of issuing new flood maps for the area, which would have led to rate increases under BW12.

We make the case that the NFIP must address affordability issues, but that this should not be done through discounted premiums.² In their recent PlaNYC report in the wake of Hurricane Sandy, New York City has recognized the importance of insurance premiums that reflect risk, stating "the City will avoid falling into a common post-disaster trap: namely, calling for subsidized coverage, which may provide short-term benefits to the insured, but contributes to other adverse long-term consequences, including encouraging high-risk behavior," (City of New York 2013: 94). For low- and middle-income residents who cannot afford flood insurance coverage when premiums are risk-based, we propose an explicitly means-tested voucher program, building on a proposal by [Kunreuther \(2008\)](#), and expanded upon by [Kunreuther and Michel-Kerjan \(2011\)](#) and [Kunreuther et al. \(2013b\)](#). More specifically, we propose coupling a means-tested voucher with a loan program for investments in loss reduction measures, which would be tied to the property and made affordable through reductions in the NFIP risk-based premium.

The next section of this paper provides background on the NFIP, BW12 and HFIAA14. Section 3 discusses the role insurance can play in providing information to individuals on the risks that they face and at the same time encouraging them to adopt loss reduction measures. It also highlights ways of dealing with issues of affordability for low- and middle-income families in redesigning the NFIP by examining the types of programs currently in place for providing vouchers for other types of goods to low-income households. Coupling a voucher program with a mitigation loan program is likely to significantly reduce costs to homeowners and the federal government as illustrated in Section 4 through an analysis of homes in Ocean County, NJ subject to storm surge flooding from hurricanes. Section 5 details our proposal of coupling vouchers with a loan program. The final section offers concluding thoughts and suggestions for future research.

²Currently, NFIP rates are essentially set for each flood zone for the nation as a whole so that some of these rates may not accurately reflect the flood risk of a specific property. Some residences are now charged higher or lower premiums than they would be if NFIP rates had been tailored to individual properties. See [Czajkowski et al. \(2013\)](#) for more details on this point using empirical data from a study of Travis and Galveston counties in Texas.

2. Background on the NFIP

The NFIP was created in 1968 because flood insurance had been unavailable to residential property by the private market since the Mississippi floods of 1927 (Kunreuther *et al.* 1978). The principal objectives of the NFIP are to support floodplain management in communities and encourage households to insure against flood losses, while achieving financial soundness in the long-run (Hayes and Neal 2011). The program was designed as a partnership between the federal government and local communities. Communities can voluntarily join the program by adopting a floodplain ordinance based on the most up-to-date flood hazard maps provided by FEMA. At a minimum, communities that choose to join must require that new development and substantially improved or damaged properties in high hazard areas be built at or above the level of a flood with a return period of one in 100 years (i.e., the 100-year flood). Only then is flood insurance made available to residents in the community. As of December 2013, close to 5.55 million policies were in-force nationwide, representing just over \$1.28 trillion USD in coverage.

Currently, single-family residences can purchase up to \$250,000 of building coverage and up to \$100,000 of contents coverage. Businesses can purchase up to \$500,000 each of building and contents coverage. Prices for these policies vary by flood risk zone based on Flood Insurance Rate Maps (FIRMs) issued by FEMA. Special Flood Hazard Areas (SFHAs), where the annual risk of a flood is 1-in-100 or greater, are divided into two broad groups: A zones and V zones. A zones are inland high-risk areas, while V zones experience coastal storm surge. More specifically, V zones are subject to breaking waves of 3ft (0.9 m) or more, and have higher risk-based rates reflecting this higher expected damage.

A household residing in an SFHA with a mortgage from a federally backed or regulated lender is required to purchase flood insurance for the life of the loan, but several data sources suggest that compliance with this requirement is not universally enforced and that compliance varies around the country (e.g., Kriesel and Landry 2004; Dixon *et al.* 2006; Kousky 2011). NFIP insurance premiums in SFHAs vary with the characteristics of the structure, such as whether the home has a basement, the number of floors, and, importantly, the height of the lowest floor relative to base flood elevation (BFE) — the estimated height of floodwaters during a 100-year flood.

Before BW12, premium discounts were given to any structure that had been built before FEMA had mapped the flood risk in an area (referred to as pre-FIRM structures). The discounted premiums were designed to encourage greater participation in the program by both communities and individuals, and to not penalize homeowners who would otherwise see a sudden drop in property values. These

discounts were never means-tested and not targeted at lower-income households (Kunreuther 1968; Pasterick 1998; Hayes and Neal 2011). FEMA estimates that policyholders with discounted premiums are paying roughly 40–45 percent of the full-risk price, although their premiums are often higher than structures adhering to building codes (Hayes and Neal 2011). Nationwide, FEMA estimates that roughly 20 percent of flood insurance policies receive premium discounts.

The program thus historically has had two classes of policyholders: those charged premiums based on modeling of the flood risk by zones, and those given premium discounts. FEMA made the assessment in the 1980s that the combined revenue from these two classes of policy holders should be enough to cover losses from the “average historical loss year,” which was calculated as the mean annual loss over the life of the program. The program was given borrowing authority from the U.S. Treasury to cover higher-than-average loss years. In contrast, an actuarially fair premium set by a private insurance company would include in all policies consideration of catastrophic loss years, the cost of capital, and the requirement to have access to enough capital to minimize insolvency risk.

Prior to Hurricane Katrina in August 2005, no catastrophic loss year had occurred in the program’s history that would have been large enough to substantially alter the calculation of the average historical loss. The NFIP paid out more claims in 2005, however, than it had paid out over the entire life of the program to that point (Hayes and Neal 2011). Fully including Katrina as part of the NFIP’s loss experience in calculating the “average historical loss year” would have increased flood insurance premiums on pre-FIRM properties significantly. FEMA did not want to take this step without the explicit support of Congress and, for this reason, gave 2005 a weight of only 1 percent in calculating the average historical loss year (Hayes and Neal 2011). Michel-Kerjan (2010) calculated that over the period 1978–2008, the average cost of flood insurance nationwide was \$2.90 per \$1,000 of flood insurance. If the NFIP wanted to immediately recoup the deficit caused by Katrina, this average premium would have had to increase to \$4.70. After Katrina, the NFIP borrowing authority was raised to \$20.775 billion USD.³

The significant NFIP debt and the need to find ways for generating more revenue for handling future flood insurance claims created broad interest in reforming the program. A consensus in Congress emerged around the need to eliminate the premium discounts so as to put the program on a sounder financial footing. In early July 2012, BW12 reauthorized the NFIP for five years through September 30, 2017; since 2008 it had been operating under multiple short-term

³After Hurricane Sandy, the U.S. Congress increased the NFIP borrowing authority again. As of January 2014, this debt stood at around \$24 billion USD.

extensions and the program had even been allowed to lapse. Although the legislation instituted many changes to the operation of the NFIP, we focus here on the changes it made to the pricing of insurance policies.

Under BW12, pre-FIRM premiums were to be increased 25 percent a year beginning in 2013 for non-primary residences, severe repetitive loss properties, and business properties, until they reflected FEMA's best estimate of the flood risk. Discounted premiums were to be eliminated for single-family households under the following conditions: a policy lapses, sale of the property, the property sustains substantial flood damage (defined as damage greater than 50 percent of the home's value), the property is substantially improved, or a new policy is purchased. Beginning with policy renewals in October 2013, elevation certificates were required for pre-FIRM discounted policies to ensure proper pricing since rates vary with the elevation of the structure above BFE.⁴ The Government Accountability Office (GAO) estimated that roughly 438,000 policies nationwide would have seen higher rates immediately; 715,000 policies would have had their premiums remain at the current level until one of the triggers was met (GAO 2013). Importantly, BW12 also called for phasing out *grandfathering*, a practice that enabled homeowners to keep their old premiums when a new map reclassified them into a higher-risk zone, as long as they had built in accordance with the map that was adopted at the time of construction. Had BW12 been implemented, the insurance rates in the higher-risk zones after re-mapping would have been phased in at 20 percent per year so that the premium would reflect risk within five years.

As the new rates were beginning to be phased in — particularly in response to new FEMA maps, such as those being produced for the Sandy-impacted region — concern began to mount regarding the affordability of flood insurance. Some homeowners felt that their proposed premium increases were unjustified and/or financially burdensome. These concerns led Congress to pass HFIAA14, which reinstated grandfathering and eliminated the triggers that would have led to the loss of pre-FIRM discounts when a property was sold or a new policy purchased. Thus, single family homeowners are now able to keep discounted and grandfathered rates. Non-residential properties and severe repetitive loss properties will still see their discounts phased out. HFIAA14 capped any rate increases at 15–18 percent per year and refunded homeowners who had begun to pay premium increases under BW12 that are no longer required. To deal with the NFIP debt problem given the above changes, HFIAA14 requires a \$25 fee on all residential policies and a

⁴Currently, FEMA does not have data on elevation levels of many of the homes in flood-prone areas, which is another reason why the NFIP rates do not reflect these structures' flood risk.

\$250 fee on non-residential policies. In this respect, HFIAA14 introduces more cross-subsidization into insurance premiums than prior to BW12.

In addition, the new Act specifies that FEMA “strive to minimize the number of policies that [have premiums which] exceed one percent of the total coverage provided by the policy,” implying that the maximum premium for \$50,000 in flood insurance coverage should be \$500, independent of flood risk or affordability considerations. FEMA is required to report to Congress any exceptions to this guideline. If FEMA implements this provision regardless of flood risk or income, development in flood-prone areas would be encouraged through a further subsidization of premiums for those facing a high flood risk. It could also lull homeowners into thinking that they are safe and thus discourage them from undertaking loss reduction measures. Furthermore, if they currently are charged a highly discounted premium, it is highly unlikely that it would be reduced further if the homeowner took steps to mitigate future flood losses.⁵

3. The Role of Insurance and the Affordability Challenge

A well-designed flood insurance program could play an important role in linking investments in loss reduction measures with financial protection to cover damage from disasters (Kunreuther *et al.* 2013a). The insurance premium itself can act as a powerful signal as to the likelihood of a loss, and encourage investment in mitigation measures if homeowners can receive premium reductions reflecting the resulting reduction in expected claim payments following a disaster. Before being reversed, BW12 had taken an important step in this direction by requiring risk-based premiums on some properties that had historically been charged discounted premiums.

However, for some homeowners residing in the floodplain, such higher premiums would have imposed an unexpected financial burden. For insurance to play its desired role, we argue that risk based premiums should be maintained and that insurance vouchers financed by general taxation be used to address affordability concerns. Low-interest loans and/or vouchers could encourage investments in loss-reduction measures that will result in lower premiums. There are several existing programs that could serve as models for developing such a coupled voucher and loan system and we briefly review them here. Note that BW12 requested FEMA to study the affordability issue in more detail and HFIAA14 not only removed the cap on the funding for the study but requires the development of an affordability

⁵See <http://www.insurancejournal.com/news/national/2014/03/13/323273.htm> for more details on MG14.

framework for implementing proposed measures. The National Academy of Sciences (NAS) launched this study in January 2014 (full disclosure: both authors are members of the NAS Committee).

3.1. Housing Choice Voucher (HCV) program⁶

This is the federal government's primary program for assisting very low-income families, the elderly, and the disabled so that they can afford decent, safe, and sanitary housing. Vouchers are given to families so they can use the private market to find a place to live. HCVs are administered locally by public housing agencies (PHAs) that receive federal funds from the U.S. Department of Housing and Urban Development (HUD) to administer the program.

Families choose where to live and are encouraged to consider several housing choices for meeting the family's needs. To be eligible for a housing voucher, the family's income may not exceed 50 percent of the median income for their county or metropolitan area. By law, a PHA must provide 75 percent of its vouchers to applicants whose incomes *do not exceed 30 percent of the area's median income*. The PHA inspects the property to determine that it meets an acceptable level of health and safety and that the rent is reasonable. The amount of the voucher is determined based on local housing markets. A family is required to pay 30 percent of its adjusted gross income toward housing-related expenses.

3.2. Food stamp program⁷

Under the federal food stamp program, a family is given vouchers to purchase food based on their annual income and family size. To be eligible, gross monthly income must generally be 130 percent of the poverty line or less. The concept for the program was born in the late 1930s, revived as a pilot program in 1961, and expanded nationwide in 1974. Its current structure was implemented in 1977 with the goal of alleviating hunger and malnutrition by permitting low-income households to obtain a more nutritious diet through normal purchasing of food from grocery stores. On October 1, 2008, the federal Food Stamp Program was renamed the Supplemental Nutrition Assistance Program (SNAP). The federal government funds the program and shares administrative costs with the states. As of fiscal year 2014, there were over 22.9 million households and over 47 million persons participating in the program. In November 2013, funding to SNAP was cut by

⁶http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/hcv/about/fact_sheet provides more details on housing choice vouchers.

⁷http://www.frac.org/html/federal_food_programs/programs/fsp.html provides more details on the food stamp/SNAP program.

\$5 billion; the Farm Bill passed in early 2014 cut an additional \$8.6 billion over 10 years to 850,000 families.

3.3. Low Income Home Energy Assistance Program (LIHEAP)⁸

The mission of this program, housed in the U.S. Department of Health and Human Services, is to assist low-income households in meeting their immediate energy needs. Funding is provided by the federal government but is administered by the states to help eligible low-income homeowners and renters pay heating or cooling expenses. Eligibility is based on income levels, which vary with household size (for a family of four, it is currently \$34,575; households are automatically eligible if participating in other programs, such as SNAP). The federal government became involved in awarding energy assistance funds to low-income households program as a result of the increase in oil prices resulting from the Organization of Petroleum Exporting Countries (OPEC) oil embargo in 1973. Approximately \$2.9 billion in federal funds has been allocated to the program in fiscal year 2014. According to testimony to the House of Representatives from the National Energy Assistance Directors' Association in May 2013, the program served roughly 8.9 million households in FY2013.

3.4. Universal Service Fund (USF)⁹

The U.S. Federal Communications Commission created the USF in 1997 to ensure that consumers in all regions of the nation have access to telecommunications services that are reasonably priced, relative to those in urban areas. To achieve this goal, the USF provides discounts that make basic local telephone service affordable to low-income consumers in high-cost rural areas. Participants must have an income that is at or below 135 percent of the federal poverty guidelines, or participate in other assistance programs. The program pays up to \$30 of the telephone service installation fees, and provides up to \$200 for a one-year, interest-free loan for any additional installation costs. It also provides discounts of up to \$10 per month for phone service depending on the location. All telecommunication carriers that provide service internationally and between states pay contributions into the USF. The carriers may build this factor into their billing systems if they choose to recoup this amount from their customers.

We suggest that means-tested vouchers provided by general taxpayer funds help cover the costs of flood insurance on affordability grounds. This financial

⁸For more details on the LIHEAP program, go to <http://www.acf.hhs.gov/programs/liheap/>.

⁹For more details on the USF program, go to http://en.wikipedia.org/wiki/Universal_Service_Fund#Low_income.

arrangement implies that everyone in society has some responsibility for providing assistance to those who need financial assistance to cover the costs of goods and services that are deemed important or necessary.

4. A Case Study of Ocean County, New Jersey

We motivate our voucher and loan proposal with a case study that focuses on the affordability of flood insurance in Ocean County, New Jersey. Ocean County was chosen for study because it was hard hit by Hurricane Sandy, has many NFIP policies-in-force, and also has a substantial middle-income or low-income population. These issues, however, are not unique to Ocean County or coastal New Jersey. Similar concerns about the affordability of flood insurance have been raised in Boston and surrounding areas, the Outer Banks of North Carolina, southern Mississippi, southern Louisiana, and New York City (e.g., Conti 2013; Hampton 2013; Lee 2013; McCormick 2013; City of New York 2013; Wharton Risk Center 2013).

Ocean County, immediately north of where the center of Sandy came ashore, sustained heavy damage from the storm; FEMA estimates that roughly half the damage in New Jersey occurred there, with 40,000 damaged buildings.¹⁰ The total taxable base in Ocean County reportedly fell \$3.6 billion due to the storm (O'Neill 2013). Several communities in the county were especially devastated. More than 8,800 residences in Toms River were damaged, 1,000 severely, according to data provided by the New Jersey Department of Community Affairs (2013). Images from Seaside Heights made headlines, particularly the iconic roller coaster that fell off the pier into the ocean during the storm; almost 60 percent of the residences — 1,929 — in the town were damaged (O'Dea 2013).

Ocean County has a large number of vacation and second homes. Among full-time residents, however, many are lower-income or retired, such that substantial increases in flood insurance rates could be a challenge. The U.S. Census Bureau estimates that over 21 percent of county residents are more than 65 years old, in contrast to 14 percent for the state of New Jersey as a whole. The homeownership rate is over 80 percent, higher than the state average of 67 percent; the median value of owner-occupied housing units is \$284,100 compared to \$349,100 for the state as a whole. Although the 9.5 percent of county residents below the poverty line is quite close to the state average, there are a number of middle-income families residing in the area. The median household income of \$60,700 is roughly \$10,000 less than the New Jersey average and approximately \$10,000 higher than the national average.

¹⁰Reported online by the Robert Wood Johnson Foundation (“‘Unprecedented Destruction’: Ocean County Public Health Continues to Respond to Hurricane Sandy”): http://www.rwjf.org/en/blogs/new-public-health/2013/03/_unprecedented_destr.html.

The analysis in this section uses quantitative information from the following sources: data provided to us by FEMA on NFIP policies sold in 2012, socio-demographic and economic data from the U.S. Census Bureau's American Community Survey¹¹ at a census-tract level, and estimates of storm surge inundation from Hurricane Sandy produced by the FEMA Modeling Task Force based on U.S. Geological Survey field data.¹²

4.1. Take-up rates and premiums before Sandy

In 2012, more than 238,600 NFIP policies were in force in New Jersey. The vast majority of those policies were in the four counties that have ocean shoreline: Monmouth, Ocean, Atlantic, and Cape May, all of which experienced surge damage from Sandy. In Ocean County in 2012, there were nearly 53,000 policies-in-force, including slightly more than 44,000 single-family residential policies. Still, prior to Hurricane Sandy, many households in flood-prone communities failed to purchase flood insurance. Using data from FEMA on NFIP policies-in-force in 2012, coupled with an estimate of the total households in each census tract, enables one to calculate the take-up rate for residential insurance policies by tract in Ocean County. Since we do not have data on the number of households located in SFHAs, take-up rates are estimated across the entire census tract.

Figure 1 shows take-up rates for residential properties in Ocean County census tracts along with an estimate of the extent of the storm surge from Hurricane Sandy. Take-up rates in the county varied substantially, based largely on proximity to the coast. Countywide, the mean take-up rate was almost 20 percent and the median was less than 2 percent. For tracts that experienced some surge, the mean take-up rate was 34 percent and the median was almost 14 percent. As seen in Figure 1, tracts along the ocean tended to have very high take-up rates, between 80 percent and 100 percent. It appears that those facing the highest risk of storm surge in Ocean County purchased a flood insurance policy; this may also reflect the effect of the mandatory purchase requirement for federally-insured mortgaged homes in SFHAs: a higher percentage of the area in tracts near the ocean are in SFHAs compared to tracts further inland.¹³

¹¹The U.S. Census Bureau provides GIS shapefiles that couple the American Community Survey five-year estimates to census tracts. We downloaded these data for the 2007–2011 estimates (the most recent available) for the state of New Jersey (<http://www.census.gov/geo/maps-data/data/tiger-data.html>).

¹²Thanks to H.E. "Gene" Longenecker, III, for providing these data.

¹³Note in Figure 1 the one unshaded tract along the ocean is largely state protected lands with no properties. The land in the bay at the southern end of the map is also largely not developed.

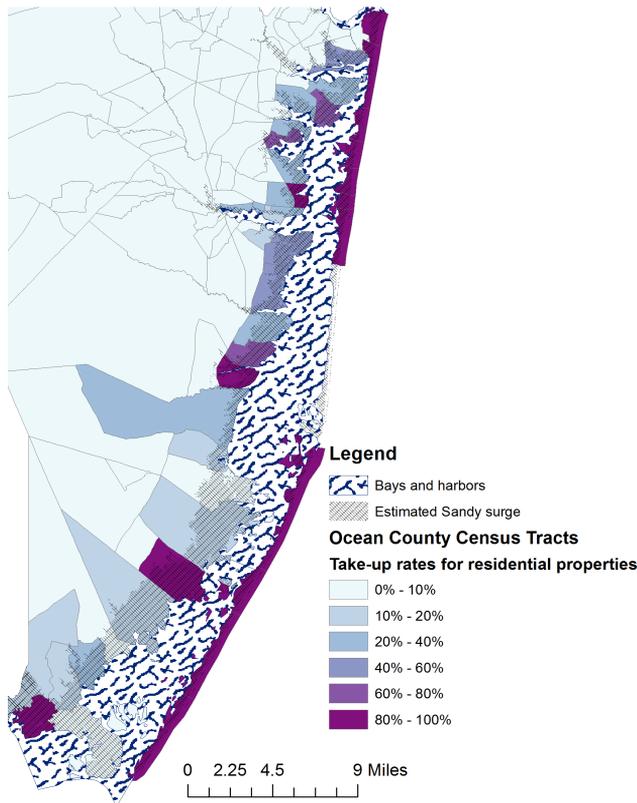


Figure 1. Take-Up Rates for Residential NFIP Policies in Ocean County, New Jersey

For comparison, we find that the average take-up rate for flood insurance for all homes across the state was only 6 percent, the average take-up rate in tracts that experienced at least some surge from Sandy throughout the state was almost 15 percent, and the average take-up rate for tracts on the ocean was 75 percent.¹⁴ Roughly 40 census tracts (out of more than 2,000 in the state) had take-up rates quite close to 100 percent in New Jersey, and almost all of them are located on the ocean coast.

¹⁴Our calculation includes condominiums and mobile homes in both the numerator and denominator. In areas having multistory buildings, however, take-up rates among those at risk will be underestimated because residents on higher floors are counted in the denominator, but they will not be at risk of suffering flood damage. The take-up rates for high-risk households are likely to be underestimated since we do not have data on the number of structures in the floodplain by census tract and so must estimate take-up rates across the entire tract.

4.2. Increasing rates: Biggert–Waters and revised hazard maps

Prior to the phase-in of Biggert–Waters’ rate changes and the adoption of new maps, median premiums in Ocean County for single-family homes were \$806 for A zones, \$3,144 for V zones, and \$376 for X zones (outside both the 100-year and 500-year flood zones). These are similar to insurance premiums rates nationwide. The most recent actuarial rate review provides the average annual premiums across the country for non-discounted policies: \$513 in A zones, \$3,088 in V zones, and \$417 for X zones (Hayes and Neal 2011).¹⁵

FEMA found that 17,984 properties in Ocean County, New Jersey currently receive a premium discount.¹⁶ This represents almost 34 percent of the total number flood insurance policies in the state and is greater than the nationwide average of 20 percent. These data were provided to us at the community or municipal level. Figure 2 shows the distribution of the number of discounted policies across municipalities in Ocean County as of January 2013. The color indicates the absolute number of discounted policies in a municipality, and the figure written within each is the percentage of policies-in-force that is discounted. The highest percentage of discounted policies (73 percent) is in South Toms River Borough.¹⁷ Little Egg Harbor Township has the second highest (57 percent).

Full elimination of the premium discounts could more than double rates, on average. The median pre-FIRM annual premium for single-family homes in Ocean County in 2012 was \$1,238. If we assume that this rate was 40 percent of the full-risk rate, the new risk-based premium of \$3,095 would be roughly 5 percent of the median income in the county, which is \$60,700. Although some families will be able to afford these increases, it will be a burden for others. Figure 3 shows the percentage of households by census tract making less than \$50,000 a year. The figure illustrates the heterogeneity with respect to the percentages of low- to middle-income households where affordability is likely to be a concern.

BW12 also generated concern about rate increases as a result of new maps, should grandfathering be eliminated. Prior to Sandy, FEMA had been in the process of updating the FIRMs for coastal New Jersey and New York. Before final maps are released, FEMA can issue *advisory maps* (akin to first drafts) and then update these to *work maps* and then to the final FIRM. We refer to the maps that

¹⁵These non-discounted premiums are similar to the averages for the state of New Jersey. Out of all the policies in the state in 2012, the median premium for A zones was slightly more than \$1,000, the median premium for V zones was more than \$3,200, and the median premium in an X zone was \$405.

¹⁶We thank Michael Miles, Kevin Montgomery, and Tim Scoville for providing these data.

¹⁷Note that South Toms River is distinct from Toms River.

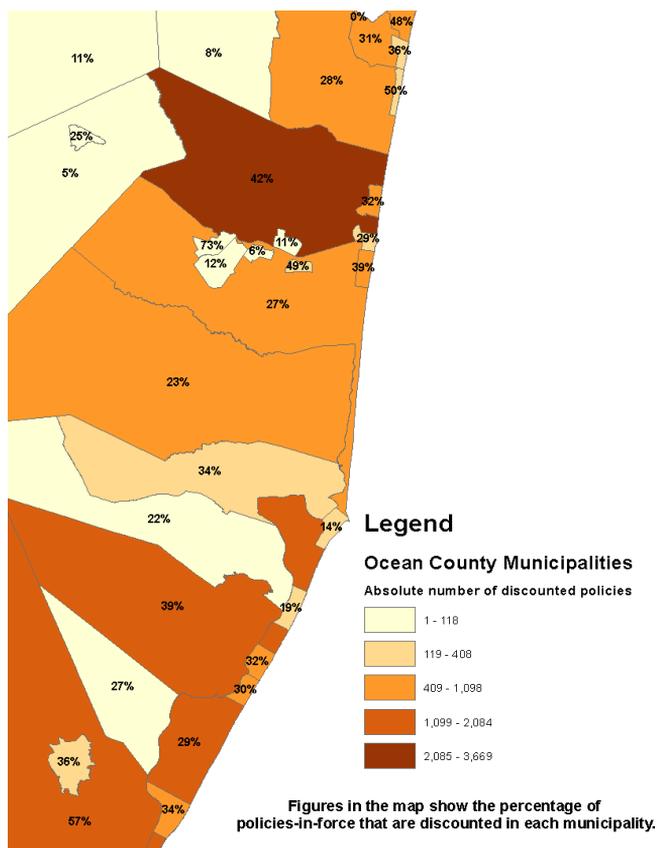


Figure 2. Discounted Policies in Municipalities of Ocean County, New Jersey

are in effect now, prior to any revisions, as the current FIRM. Advisory maps for coastal New Jersey and New York were issued within two months after Sandy to guide rebuilding activity due to damage from the hurricane. The previous maps had not been revised in more than 25 years. The remapping incorporates new data, improved methodology for mapping coastal flood hazards, and any changes in conditions such as erosion. The advisory maps showed a much-expanded SFHA, which upset residents in these areas who would have to pay significantly higher rates when the maps were finalized.

In June 2013, FEMA updated the advisory maps to work maps for some areas, including Ocean County. These work maps *reduced* the expanded high hazard area of the advisory maps in almost all locations, based on improved scientific modeling of the flood risk (FEMA 2007). FEMA reported that the V zone shrank in the work map for Ocean County by 45 percent relative to the advisory maps (CBS 2013);

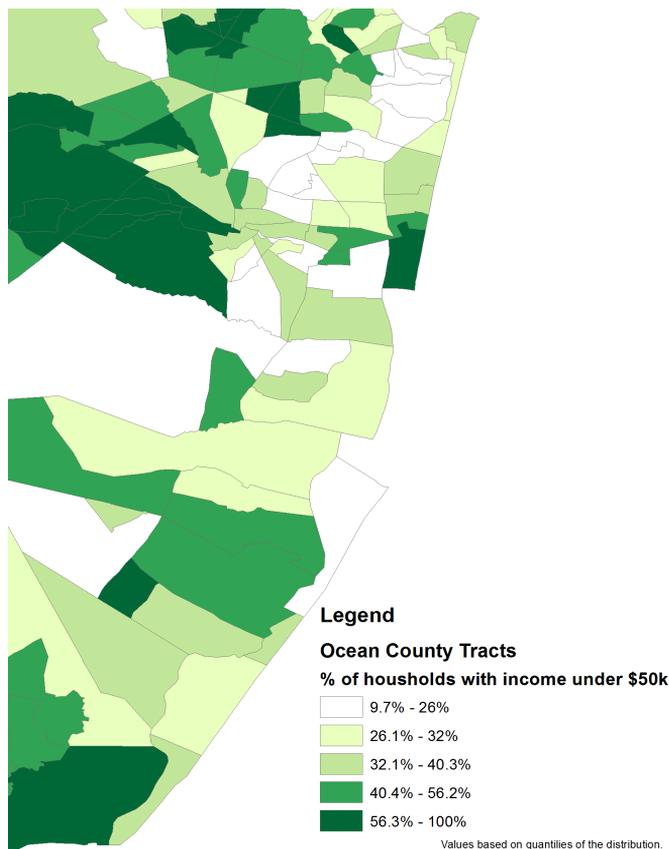


Figure 3. Percentage of Households Earning Less than \$50,000 per Year by Census Tract

however, the V zone in the work map is still an expansion relative to the current FIRM. Figure 4 depicts the V zones in Ocean County based on the current FIRM (displayed in green) as well as the newly defined V zones based on the work maps (displayed in orange). Using parcel data for Ocean County,¹⁸ we calculate that 4,503 parcels intersect the V zone in the current FIRM, and 11,294 intersect the V zone in the work maps, an increase of almost 6,800 structures.

The question homeowners had been asking was, “What will finalized flood maps mean for my insurance premium?” Premiums vary across A and V zones and they also depend on the difference between the height of the home and the estimated base flood elevation (BFE), or the height of the water in a 100-year flood. The advisory and work maps recently released by FEMA have updated BFEs.

¹⁸These data are made available to the public online by the New Jersey Office of Information Technology and the Office of Geographic Information Systems.

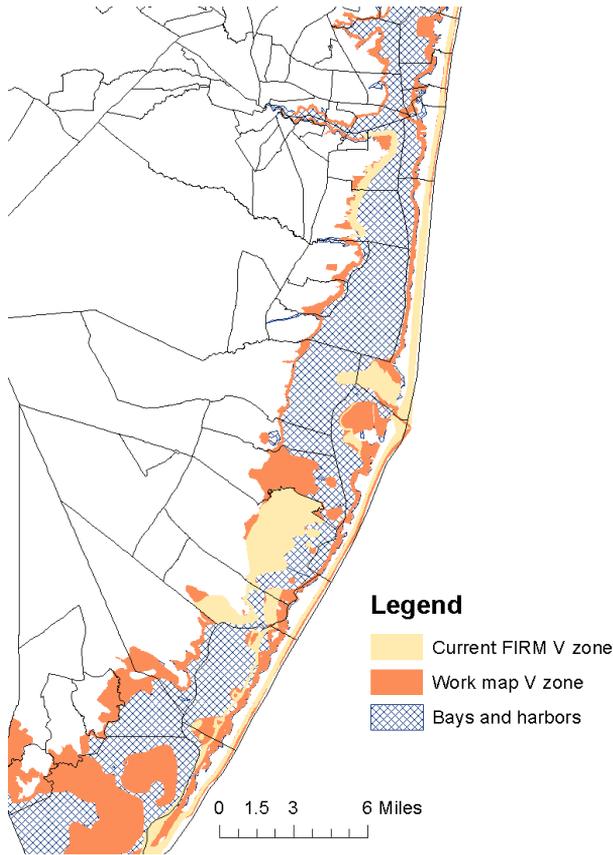


Figure 4. V Zones in Current FIRM and Work Map

Currently, these are referred to as advisory BFEs, or ABFEs. When the new maps are finalized, the updated BFEs will be used for setting rates. In the meantime, the state of New Jersey has required the use of ABFEs for the reconstruction of substantially damaged homes to ensure that rebuilding will conform to the newer hazard information. Without precise elevation data for each property to compare with the estimated BFEs on the advisory and work maps, it is difficult to say how many homeowners will discover that their properties are below the updated BFEs. Now that grandfathering is reinstated in HFIAA14, homes built in compliance with the old maps may keep their previous premiums prior to the passage of BW12.

Still, for those homes whose elevation is below the new BFE, so-called *negatively elevated properties*, premiums could be quite high if grandfathering were not allowed and risk-based rates reinstated. Using the national rates set in the 2013

Table 1. 2013 NFIP Annual Premiums for a Post-FIRM, One- to Four-Family Residence Purchasing \$250,000 Coverage

	3 Feet Below BFE	1 Foot Below BFE	At BFE	1 Foot Above BFE	4 Feet Above BFE
A zone	Not rated	\$2,199–\$4,483	\$778–\$1,315	\$429–\$616	\$296
V zone	\$13,950–\$23,150	\$8,950–\$15,925	\$6,750–\$12,050	\$4,675–\$8,725	\$2,050–\$4,150

Note: As stated above, rates vary based on characteristics of the structure. The ranges in this table show variations in the premium depending on the structural characteristics of the house.

Flood Insurance Manual (FEMA 2013), we calculated annual insurance premiums for A and V zone properties at various elevations relative to their BFEs as shown in Table 1.¹⁹ We consider a post-FIRM, one- to four-family residence purchasing \$250,000 coverage. The premiums for A zone properties are a function of the number of stories and whether the property has a basement. The range of premiums for the V zone properties depends on the ratio of the amount of coverage purchased relative to the replacement value of the property. FEMA's manual does not currently provide premium estimates for A zone properties more than one foot below BFE or for properties in V zones more than three feet below BFE.

V zones have higher rates than A zones because of the hazard of wave action. Rebuilding is also more costly because there are stricter codes in V zones than in A zones. More specifically, A and V zone properties must be elevated to the BFE, but V zone properties must also be protected against wave action, wind, and erosion. V zone properties must be raised on pilings, whereas A zone properties could have a foundation or crawl space below BFE.

5. Lowering Premiums Through Hazard Mitigation

Insurance premiums can be made more affordable through hazard mitigation. When insurance prices are based on risk, elevating a house so it is above the BFE could save thousands, if not tens of thousands, of dollars on annual flood insurance premiums as shown in Table 1;²⁰ however, it is an expensive mitigation measure.

¹⁹FEMA has commissioned a study by the National Academy of Sciences on the rating for negatively elevated properties, so these premiums could change in the future. More information on the study can be found online at: <http://www8.nationalacademies.org/cp/projectview.aspx?key=49587>.

²⁰The NFIP currently gives reductions in premiums when homes are elevated. There are other hazard mitigation options that may be cost-effective for reducing flood damages, but for which the homeowner would not receive a discount on their NFIP premium. This is why we focus our attention on home elevation. On the costs of different flood management strategies for New York City, see [Aerts et al. \(2013\)](#).

A recent *New York Times* article estimated that the cost of elevating an existing house can range from \$10,000 to \$100,000 depending on its size, weight, and when it was built (Harris 2013). One company in New Jersey that elevates homes estimates on its website that the average cost is \$45,000 to \$50,000, and another New Jersey company offers a range of \$30,000 to \$100,000.²¹

Homeowners have four sources of potential government funding to assist them in elevating existing properties during the post-disaster period (none of these sources provide funds for pre-disaster elevation). First, a homeowner could apply for a subsidized disaster loan from the Small Business Administration (SBA) to cover the costs of repair to his or her property after a disaster. The amount of the loan can be increased by up to 20 percent of the total disaster damage if the additional funds are used to make hazard mitigation improvements to the property, such as elevating it.²²

Second, a homeowner with an NFIP policy whose property was substantially damaged (meaning that repairs will cost at least 50 percent of the building's pre-disaster value) may be eligible to receive Increased Cost of Compliance (ICC) payments (a coverage included in most standard NFIP policies) of up to \$30,000 to reimburse the costs of bringing a structure into compliance with building regulations in place.²³ In communities that have adopted the new ABFEs, ICC funds will be available to help homeowners elevate to the required levels. In communities that have not adopted the ABFEs, however, funds will be available only to comply with the effective FIRM. Further, the total cap on insurance claims for flood damage to residential structures is \$250,000 (the coverage limit), and ICC funds are not available to cover property damage in excess of this cap.²⁴

Third, Hazard Mitigation Grant Program (HMGP) funds are made available to states by FEMA following a presidential disaster declaration to fund hazard

²¹See LBI House Raising's "Frequently Asked Questions" (<http://lbihouseraising.com/faqs/>) and Axis Builders, LLC's "Cost To Raise a House in NJ" (<http://www.njhouseraising.com/index.php/cost-to-raise-your-home>). FEMA has also provided estimates that range from \$32/sqft for wood frame structures on a concrete or block foundation to \$45/sqft for slab-on-grade homes (see: http://www.fema.gov/media-library-data/20130726-1609-20490-7375/fema551_ch_08.pdf).

²²For more on Small Business Administration loans and other disaster aid available to homeowners, see Kousky and Shabman (2012).

²³For more on the ICC program, see: www.fema.gov/library/viewRecord.do?id=1477. Legislation passed in 2004 allowed this coverage to be used to cover the non-federal cost-share component associated with FEMA mitigation grants, even in the absence of a flood loss.

²⁴If a home with coverage of \$250,000 is totally destroyed and FEMA inspections indicate that a claim of \$250,000 is warranted, no extra Increased Cost of Compliance (ICC) funds will be available for the homeowner. We thank Jeffrey Woodward of FEMA for helpful comments on the use of ICC funds.

mitigation measures that pass a cost-benefit test. Local governments can develop projects for the use of HMGP funds and submit their proposals to the state. If a community applies for and receives HMGP funds for elevating structures, residents of that community could potentially obtain financial assistance to help fund a portion of the costs of undertaking this measure.²⁵

A fourth potential source of funds is Community Development Block Grants. Emergency supplemental legislation passed in response to Hurricane Sandy funneled substantial amounts of money to affected states through Community Development Block Grants. Plans on the use of the funds must be developed and approved by the Department of Housing and Urban Development (HUD). If plans include elevating homes, this could be another source of funds with which homeowners might mitigate future flood damage to their properties — should they apply and receive funding.²⁶

5.1. Designing a coupled voucher and mitigation loan program

As discussed above, the NFIP has historically given premium discounts to make insurance less costly, but these were never means-tested or targeted to low-income property owners. Here, we propose that insurance premiums be risk-based to communicate accurately the nature of the flood hazard and to encourage investments in loss-reduction measures. To address affordability concerns of low- and middle-income homeowners, we propose using vouchers, rather than relying on pre-FIRM discounts and grandfathering.²⁷ Here, we explore coupling means-tested vouchers with hazard mitigation requirements to be financed with low-interest loans. By requiring hazard mitigation, future disaster losses would be reduced both for the NFIP and for low- and middle-income families. We suggest limiting this program to homeowners in A and V zones, the two zones where insurance is required as a condition for a federally insured mortgage.²⁸ Second homes would not be eligible for vouchers.

Such a voucher program has two key aspects. First, it operates in parallel with risk-based premiums that are essential for communicating information about flood

²⁵More details on the HMGP can be found on FEMA's website at: <http://www.fema.gov/hazard-mitigation-grant-program>.

²⁶More details on the disaster related CDBGs can be found on the HUD website: http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/drsl.

²⁷The same concepts for addressing affordability issues could be used to deal with equity or fairness concerns.

²⁸Flood insurance rates in other zones are likely to be relatively inexpensive so that affordability issues are unlikely to arise there.

risk to communities, developers, and residents. Second, vouchers (based on the household's income) are used not only to cover a portion of the increased insurance premium, but also to cover the costs of the loan for mitigating damage to the residential property.

The amount of the combined insurance and loan voucher would be determined using a sliding scale based on annual family income.²⁹ For instance, if income is less than \$X, the household could pay \$P* toward an insurance policy where \$P* is an amount considered to be affordable. If the NFIP premium is higher than \$P*, the voucher would be the difference between the NFIP premium and \$P*. The federal government could cover the costs of this voucher, or a fee could be assessed on all NFIP policies. A national dialogue is required to determine who should bear the costs of making flood insurance affordable to those in need.

We recommend that this voucher system be independent of the NFIP. It may be appropriate to locate it within HUD, rather than FEMA since HUD operates the Housing Choice Voucher program described in Section 3 that provides a model for how such a system could work for flood insurance as noted by the [Association of State Floodplain Managers \(2013\)](#).

Before implementing a voucher program for the NFIP, research would need to be conducted to identify a reasonable percentage of gross income that could be allocated to flood insurance. Guidance could be obtained from other federal means-tested programs. To illustrate how such a voucher system would operate, we assume for this example that this percentage is determined to be 5 percent. In this case, a family earning roughly the median Ocean County income of \$60,000 a year could pay up to \$3,000 toward their NFIP policy. If they lived in a V zone with their property at BFE and an insurance premium of \$6,700, then they would receive a voucher for \$3,700.

Certain hazard mitigation measures can reduce the risk of damage to properties in a flood event that could then be translated into a premium reduction. The much lower NFIP rates for homes elevated above BFE provide a financial incentive to invest in this mitigation measure if the annual cost of a loan to elevate a property is less than the annual savings in NFIP premiums. Many homeowners may thus elect to obtain a loan from the SBA or a private institution and mitigate their homes. If a homeowner is receiving a voucher to cover the costs of flood insurance, however, she may have a reduced incentive to take the loan and make the necessary investments in hazard mitigation because she will not reap the benefits financially of a reduced premium.

²⁹One may also want to modify the size of the voucher based on total family assets.

This is why we propose that the voucher program be coupled with mitigation requirements and a loan program. To be eligible for the voucher, standards would be adopted for the required level of mitigation. This could simply be compliance with the baseline floodplain management ordinances discussed above.³⁰ Policyholders would then be given a low-interest loan, perhaps through the SBA, to invest in the necessary mitigation. This loan would be repaid via the reduction in insurance premiums, ultimately reducing the amount of the voucher over time. The following examples illustrate how the program would work.

Consider two single-family property owners, one in an A zone and one in a V zone, both purchasing an NFIP policy for \$250,000 of coverage. Assume that each property is three feet below BFE and charged risk-based rates, such that the annual premium for the A zone resident is \$4,000,³¹ and the annual premium for the V zone resident is \$18,550.³² Further assume, for the sake of this example, that each homeowner is eligible for a flood insurance voucher and currently makes \$50,000 a year. Using 5 percent of gross income as our measure, these individuals would be expected to pay \$2,500 toward flood insurance. If no hazard mitigation were undertaken, the A zone resident would receive a flood insurance voucher for \$1,500, and the V zone resident would receive one for \$16,050. This is summarized in the top panel of Table 2.

Now, link the insurance voucher program to hazard mitigation. Under our proposed program, to qualify for the insurance voucher the homeowner would be required to elevate the house and would be given an SBA loan for this purpose. The voucher would cover the combined costs of the annual loan payment and the insurance premium in excess of \$2,500.

³⁰As stated above, we focus on elevating houses since that is a mitigation activity for which homeowners currently receive a premium discount in the NFIP. We are not aware of any study evaluating whether these premium reductions are commensurate with the reduction in expected damage from future flooding. FEMA may want to consider the cost-effectiveness of other hazard mitigation measures and provide premium discounts to reflect the reduced flood-related damage to the property and contents. The Insurance Institute for Building and Home Safety has several recommendations on their website of flood loss reduction measures such as raising electrical outlets, installing a backflow valve, and making sure the grading in the yard directs water away from the building (see: <http://www.disastersafety.org/flood/prepare-respond-recover/>).

³¹The 2013 *Flood Insurance Rate Manual* (FEMA 2013) does not have an A zone rate for properties three feet below base flood elevation. We thus adopt a rate here that is, in all likelihood, less than FEMA charges these properties. We choose this lower rate to be conservative in our calculations. If the rate was higher, the voucher amount would be higher in the absence of mitigation, and the benefit of elevating the home would be greater, as well.

³²This is the average, using the range of current published premiums in Table 1.

Table 2. Example Calculation of Costs of Mitigation Loan and NFIP Premiums

	A Zone Property	V Zone Property
<i>Insurance voucher without mitigation</i>		
Premium 3 feet below BFE	\$4,000	\$18,550
Homeowner pays 5% of gross income	\$2,500	\$2,500
Flood insurance voucher provided by the federal government	\$1,500	\$16,050
<i>Insurance voucher with mitigation</i>		
Cost to elevate 1 foot above BFE	\$25,000	\$55,000
Annual loan payment (3%, 20 years)	\$1,680	\$3,660
Premium 1 foot above BFE	\$520	\$6,700
Homeowner pays	\$2,200	\$2,500
Combined insurance and loan voucher provided by the federal government	\$0	\$7,860
Total savings from mitigation	\$1,800	\$8,190

Assume that the requirement for receipt of the voucher is that the homeowner must elevate the property to one foot above BFE, and that the cost of elevation is \$25,000 for the A zone property and \$55,000 for the V zone property.³³ Both residents receive a 20-year loan at a three percent rate³⁴ to cover these costs, resulting in annual payments of \$1,680 and \$3,660, respectively. Once the homes are elevated, annual NFIP premiums drop to \$520 for the A zone resident and \$6,700 for the V zone resident.

After elevation, no voucher is required for the A zone resident because the coupled loan payment and premium, at \$2,200, is less than the \$2,500 that the homeowner is required to pay (based on income) for insurance. The total cost to the homeowner of elevating her house is less than what she would pay for insurance when her house is not elevated (\$2,500). For the V zone resident, after mitigation, the combined payment for the loan and premium payment is \$10,360; the homeowner pays \$2,500 and the federal government pays \$7,860. This is summarized in the bottom panel of Table 2.

Figure 5 shows the costs of the insurance-only voucher and the combined insurance and loan voucher. It also shows the payments after the loan has been fully repaid. The savings from coupling mitigation with the insurance voucher are quite substantial, as shown in the figure and in the last row of Table 2. During the life of the loan, the total annual savings (the difference between the premium with

³³Elevating at the time of new construction can be less expensive than renovating existing homes.

³⁴These rates could vary depending on the SBA's determination of whether the individual can obtain credit elsewhere. If the SBA determines an individual can obtain credit elsewhere, the interest rate is currently 5 percent and is 2.5 percent for those unable to obtain credit elsewhere (see: <http://www.sba.gov/content/disaster-loan-program>).

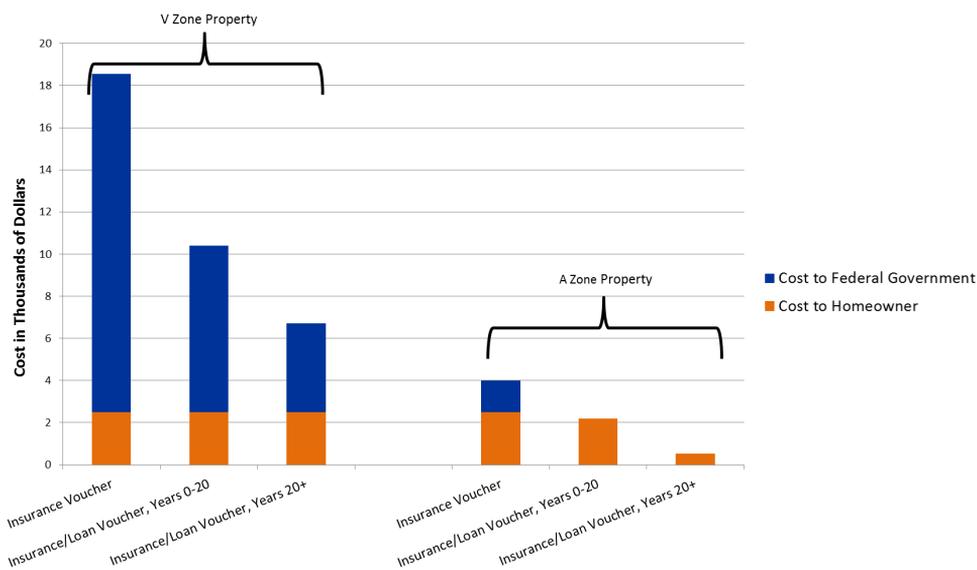


Figure 5. Cost of Program to the Federal Government and a Hypothetical Homeowner

no mitigation and the combined loan and premium after mitigation) are \$1,800 for the A zone property and \$8,190 for the V zone property.

Everyone benefits from this program. The homeowner has affordable annual payments and a safer home. The NFIP has lowered its exposure through mitigation and has improved its financial soundness through pricing that is closer to risk based. The financial institution providing the mortgage to the homeowner has a more secure investment because expected losses from a flood event are reduced. And the general taxpayer benefits from a potentially reduced need for disaster aid or bailouts of the NFIP.

One complication to consider in the design of such a program is what would happen to a mitigation loan if the homeowner moved. We recommend that (a) the insurance voucher be tied to the policyholder and his or her income level and (b) the mitigation loan be tied to the property and thus taken over by the new homeowner. The new resident would need to apply for a voucher based on his or her income; the loan payment would be part of the mortgage.

Estimating the number of homeowners nationwide that would qualify for vouchers would require a detailed analysis of income levels and the distribution of households in relation to flood risk. As a starting point, we calculated the cost of vouchers for low- to middle-income residents in Ocean County in census tracts that experienced at least some storm surge from Hurricane Sandy. Data from the American Community Survey enabled us to identify the total number of

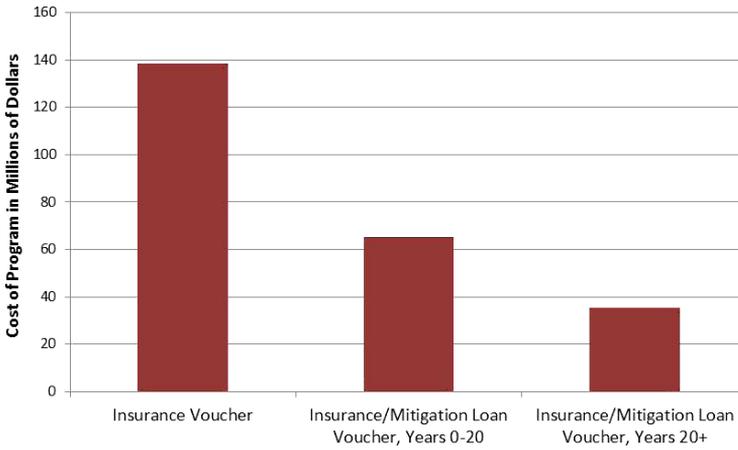


Figure 6. Estimates of Program Costs for Ocean County, New Jersey Tracts that Experienced Storm Surge

households in various income brackets. We focus on annual income brackets less than \$50,000 a year (2011 dollars). Using the mean income of the bracket and the threshold of being able to pay 5 percent of one's income toward insurance, we calculate the amount of the voucher based on the elevation costs detailed in Table 1. We assume a take-up rate equal to the mean of these tracts of 34 percent and assume an even split between A and V zone properties. These rough estimates of annual total cost are shown in Figure 6.

This proposed program would need to be complemented by a broader array of policies related to flood risk management. For example, our proposal is likely to increase insurance penetration and mitigation activity by low-income individuals, but it does not address community-level hazard mitigation investments. Land use regulations, building codes, warning systems, and other investments, such as constructing sea walls, dunes or levees, should be considered in the suite of policies related to managing hurricane or flood-related risks. The NFIP Community Rating System program is designed to incentivize these types of investments.

The federal government could also offer economic incentives for individuals in flood-prone areas to move to higher and safer ground as Governor Cuomo has done for homeowners in Staten Island (SI) and Suffolk County, Long Island in the wake of Hurricane Sandy under the NY Rising Housing Recovery Program. In Oakwood Beach, SI, strong community support has been a driving force behind the initiative, with 312 homeowners in that neighborhood indicating that they are willing to relocate to less flood-prone areas. Under the buyout program, properties purchased will be maintained as open space or transformed into coastal buffer

zones, parks or other non-residential uses that will help protect nearby communities from the impact of extreme weather.³⁵

6. Conclusions and Suggestions for Future Research

A challenge at the heart of NFIP pricing is who should pay for catastrophes. This is an issue all governments face when dealing with catastrophic risks. Part of the motivation for BW12 was the principle that individuals choosing to reside in hazard-prone areas should bear the costs of living there and that it was inequitable to have other policyholders or the general taxpayer subsidizing the insurance premiums of these properties. On the other hand, the concern by Congress in assisting low- and middle-income residents who felt the insurance premium increases were financially burdensome motivated the passage of HFIAA14. We agree that it is imperative to address the issue of affordability; however, we feel that this should be done through means-tested measures, such as vouchers, rather than via premium discounts. Coupling such financial assistance with hazard mitigation requirements increases homeowners' safety, reduces future flood losses, and lowers the total cost of insurance vouchers. It will also reduce the financial burden on the general taxpayer.

Coastal areas are dynamic and the risk of flood events will continue to change over time. Erosion events, local subsidence, and sea level rise all contribute to changing flood risk for coastal communities. Remapping to take account of these changes will be necessary and should be done with more frequency than in the past. The current remapping effort in the Sandy-impacted region has shown how disruptive abrupt changes in the delineation of risk can be for homeowners and communities. A coupled voucher and loan program could help ease the necessary transitions for homeowners as new information on a risk becomes available.

Our examination of the trade-off between risk-based pricing and affordability in the NFIP has raised issues for future research. A more detailed, nationwide analysis is needed to estimate the costs to the federal government of a coupled voucher and mitigation loan program, as well as the expected benefits of reduced flooding losses in the future. This could include an assessment of the amount households could reasonably be expected to pay toward insurance. Surveys of residents, both in and out of floodplains, regarding their perception of the equity of risk-based pricing and insurance vouchers could help inform the public dialogue on this issue.

³⁵For more details on the buyout program, see <https://www.governor.ny.gov/press/11182013-staten-island-homeowners-affected-by-hurricane-sandy>.

Future studies could also compare and contrast other policy approaches with means-tested vouchers for addressing the tension between risk-based pricing and affordability of disaster coverage. These could include measures such as government provision of disaster assistance, relocating households out of harm's way — particularly those that cannot mitigate their homes effectively — in combination with compulsory and voluntary government and private-sector disaster insurance programs. These arrangements distribute the costs of disasters between homeowners and the government in different ways and also have different impacts on total disaster exposure. Finally, it will be important to examine the effect of sea level rise and changing storm patterns and its effect on insurance prices and affordability issues.

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