

# Prepurchase Counseling Effects on Mortgage Performance: Empirical Analysis of NeighborWorks® America's Experience

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## Abstract

*NeighborWorks® America has a nationwide network of nonprofit affiliates offering prepurchase counseling throughout the country. This study, based on 75,000 loans originated between 2007 and 2009, analyzes the effect of prepurchase counseling and education provided by the network on the performance of counseled borrowers' mortgages compared with the performance of borrowers who received no such counseling services. The counseling includes help in avoiding deceptive practices, such as misleading starter interest rates without disclosure of their later increase.*

*The study shows that NeighborWorks® America's prepurchase counseling works. Clients receiving counseling are one-third less likely to become 90 or more days delinquent during the first 2 years than those not receiving counseling. The finding is consistent across years of origin, even as the mortgage market changed, and it applies equally to first-time homebuyers and repeat buyers. The analysis uses two methods to avoid a common pitfall of such studies: selection bias. It employs propensity scoring to reduce the differences between counseled and noncounseled samples and includes many variables available from credit-reporter Experian to measure borrowers' credit attitude and approach that would usually be unobservable. The effect of counseling remains strong after selection bias is limited, reducing the likelihood that borrowers get into trouble through deceptive practices and other means.*

## Introduction

Neighborhood Reinvestment Corporation—doing business as NeighborWorks® America (hereafter, NeighborWorks)—has a nationwide network of affiliates offering prepurchase homebuyer counseling throughout the country. Although the network members started to provide prepurchase counseling in 1978, the effect of these services on mortgage performance has not yet been formally evaluated.

Using information on about 75,000 loans originated between October 2007 and September 2009, this study analyzes the effect of NeighborWorks-network-provided prepurchase counseling on the performance of counseled borrowers' mortgages within 2 years after they are originated compared with the mortgage performance of borrowers who receive no such services.<sup>1</sup>

The study hypothesis is that education and counseling help buyers sustain their mortgages by avoiding mortgages with unexpected increases in interest rates over time; borrowing loans within their means to repay; promoting strengthened and realistic budgeting; improving financial management, including maintaining necessary reserves for home maintenance or income downturns; and raising borrowers' understanding of the terms and obligation of mortgage instruments. Those receiving prepurchase counseling may have avoided many of the deceptive practices by mortgage lenders that contributed to delinquency and default in the later 2000s.

Our research deals directly with a primary challenge to previous work on the effects of prepurchase counseling: selection bias. The concern is that people who enter counseling may have unobserved characteristics in the way they manage credit that both lead them to counseling and improve (or reduce) their mortgage performance. Without a way to control for the “unobservables,” statistical analysis could yield an overstatement (or understatement) of the effect of counseling in statistical estimations. This analysis mitigates the effect of selection bias in two ways.

First, Experian, a credit-reporting agency that partnered with us on this study, employed a procedure called *propensity scoring* to identify and create a comparison group that has the same observable characteristics as counseling clients. Second, we estimated program effects with data from Experian that contain extensive detailed information about borrowers' credit practices and behaviors both at origination and before receiving their mortgage. Many of these oft-unobservable characteristics are, in fact, observed in specific operationalized terms in our study. Given these methodological elements, our findings are based on data and methods that control for factors that may influence both an individual's choice to select counseling and their mortgage performance, significantly reducing any selection bias. We find that prepurchase counseling retains its highly significant and substantial effect after biasing factors have been removed.

These means of dealing with selection and missing variables biases are not perfect. It is possible (with anything but a strictly randomized experiment) that unobservable factors are still playing a role in homebuyers' selecting to participate in the prepurchase counseling program—factors that may correlate with the decision to enter counseling and that may bias our analysis of counseling's effect. In addition, as discussed later in the article, there are measures of loan characteristics and of

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<sup>1</sup> NeighborWorks also provides training for counselors who work for other organizations. We did not measure the impact of counseling performed by these non-NeighborWorks organizations.

noncounseling assistance to buyers that our study does not account for, which, again, if correlated with entering counseling, could bias these results. Our study, however, does address many of the credit history, attitude, and financial capability variables, which numerous other researchers have highlighted as being prominent among the unobserved factors that might bias their studies. Our research, by drawing on credit data not previously available to others, addresses one of the major limitations of past work.

## **NeighborWorks Prepurchase Counseling Programs**

Congress created NeighborWorks in 1978 to revitalize America's underserved communities. Local NeighborWorks organizations are independent, resident-led, nonprofit community development corporations that include business leaders and government officials on their boards. More than 230 local organizations make up the NeighborWorks network, and many of them actively promote homeownership through counseling, lending, and other means.

Prepurchase counseling provided by NeighborWorks organizations consists of a minimum of 8 hours of group education and individual counseling sessions. Homebuyer education includes an initial orientation and overview of the home purchase process; an indepth analysis of the potential homebuyer's personal and financial situation; details about house selection, the financing process, the closing, and other key issues of the homebuying process; and postpurchase concerns, such as home maintenance and community involvement. NeighborWorks recommends that counseling sessions cover the following topics.

1. Assessing readiness to buy a home.
2. Budgeting and credit.
3. Financing a home.
4. Selecting a home.
5. Maintaining a home and finances.

Most clients first attend a 1- or 2-hour orientation session that enables participants to self-select into the different tracks of homebuyer education according to their readiness. Individual counseling supplements other kinds of homebuyer education by focusing on problems and issues that are specific to a particular homebuyer. The sessions generally include information on budgeting, developing a savings plan, credit issues and repairing credit, and selecting a home (NeighborWorks® America, 2016).

## **Literature Review**

Three recent comprehensive reviews of previous studies on the effect of prepurchase counseling are Cackley (2011), Collins and O'Rourke (2011), and Turnham and Jefferson (2012). All the prepurchase counseling programs included in these reviews are designed to give borrowers information and specific strategies to understand mortgage options and avoid predatory lending. Prepurchase

counseling programs are expected to result in better subsequent mortgage performance because they create well-informed consumers and promote responsible homeownership that reduces the risk of default to lenders (Turnham and Jefferson, 2012).

All three reviews (Collins and O'Rourke's summary is presented in exhibit 1, augmented with one study that postdated their review) conclude that the existing literature on prepurchase counseling provides ambiguous findings regarding prepurchase counseling's effectiveness as measured by mortgage loan performance, credit scores, and borrowers' self-reported financial capacity. Cackley (2011: 3) concludes "[t]he limited body of literature on homeownership counseling does not provide conclusive findings on the impact of all types of homeownership counseling."

Previous studies on prepurchase counseling's effectiveness, according to reviews of the literature, are hampered by the difficulty of tracking counseling recipients after the counseling ends and by the fact that no studies used an experimental design that randomly assigned clients into a treatment group that received counseling and a control group that did not receive these services. Existing quasi-experimental studies, according to the reviews, do not adequately correct for selection bias. None had use of detailed measures of homebuyer past performance with various forms of credit with which to control for the characteristics that might lead to selection into counseling.

Nonetheless, as detailed in exhibit 1, all but two of the studies that analyze prepurchase counseling's effect on mortgage performance found that mortgage performance improved with counseling. The order of magnitude of these findings was large in two studies: Hiran and Zorn (2002) found that rates for 90 or more days of delinquency were 34 percent lower among clients receiving counseling; Agarwal et al. (2009a) found that the prepurchase counseling reduced delinquency rates by 30 percent but attributed this difference to lenders' changing their behavior rather than the services received by counseling.

At least four recent studies overlapped in timing with our research and writing and postdated the literature reviews cited previously. The first of those studies (Avila, Nguyen, and Zorn, 2013) analyzed nearly 38,000 mortgages originated under Freddie Mac's affordable lending programs between 2000 and 2008. First-time borrowers were required to obtain counseling for most of the period and comprised the bulk of the "treatment" group while repeat borrowers and first-time borrowers between 2006 and 2008 were not counseled. Probit models, including both models of 90-day delinquencies and of selection into counseling, including variables for some credit characteristics, were estimated to deal with selection bias. The key result was that counseling reduced the delinquency rate of first-time buyers by 29 percent and the overall population by 15 percent. Repeat buyers did not show a significant response to counseling. The significant relationship between being a first-time buyer and being required by the programs to obtain counseling raises questions about this sharp difference.

Another study drew on a smaller sample of potential homebuyers (not all of whom eventually bought homes) participating in a program of the Federal Reserve Bank of Philadelphia (Smith, Hochberg, and Greene, 2014). Some 898 households, first-time buyers only, were randomly assigned to a control group, which received only a 2-hour homeowner education presentation, or a treatment group, which received one-on-one counseling (in most cases) in addition to the presentation. This random assignment addresses directly the selection bias issue that challenged

**Exhibit 1**

**Summary of Previous Evaluations of Prepurchase Counseling (1 of 2)**

Author(s)	Year	Method	Sample Size	Intervention	Outcome Measure(s)	Key Findings
Agarwal et al.	2009a	Quasi-experimental with matched pairs comparison	1,200 borrowers receiving counseling	Mandatory prepurchase financial counseling for high-risk mortgage applicants	Default rate	Default decreased by 30%; authors attribute the decline to lenders' screening rather than counseling per se.
Agarwal et al.	2009b	Quasi-experimental with multiple estimations strategies	12,919 observations	Voluntary prepurchase financial counseling for mortgage applicants with barriers to homeownership; borrowers who became delinquent were also offered postpurchase counseling	Mortgage delinquency rate	Lower default rates that the authors attribute to the mortgage characteristics originated to participants, the skills participants gained during prepurchase counseling, and the program's postpurchase component.
Archer, Fitterman, and Smith	2009	Quasi-experimental with logistic regression	41 Florida participating jurisdictions	Florida nonprofit organization offering education after purchase contract is signed	Default rate	Homebuyer education has a statistically significant negative effect on aggregate, jurisdictionwide loan performance. The authors caution that this finding is likely not causal.
Avila, Nguyen, and Zorn	2013	Quasi-experimental selection model (probit)	38,000	Prepurchase homeownership and education counseling	Mortgage performance	Counseling reduced the delinquency rate of first-time buyers by 29% and the overall population by 15%.
Birkenmaier and Tyuse	2005	Descriptive pretest	203	Homeownership education and counseling	Credit scores	No statistically significant change in credit scores.
Brown	2015	Natural experiment	732	Classroom education	Default and foreclosure	Default effect not significant; foreclosure effect 42% decrease in odds.
Carswell	2009	Descriptive retrospective pretest	405	Prepurchase homeownership counseling	Self-reported financial behaviors	75.2% of respondents agreed that they had no difficulty paying their mortgage; 85.5% of respondents agreed that their mortgage took top priority over other bills.
Hartarska and Gonzalez-Vega	2005	Quasi-experimental selection model	919	Prepurchase credit counseling	Mortgage loan default and prepayment	For observations before 1996, when counseling was not mandatory, those counseled did not default less but prepaid more often. For the sample as a whole, the counseled defaulted less often and prepaid more often.

**Exhibit 1**

**Summary of Previous Evaluations of Prepurchase Counseling (2 of 2)**

Author(s)	Year	Method	Sample Size	Intervention	Outcome Measure(s)	Key Findings
Hartarska and Gonzalez-Vega	2006	Quasi-experimental selection model	233	Prepurchase credit counseling	Mortgage loan default	Counseled borrowers' default rate was 39%.
Hirad and Zorn	2002	Quasi-experimental selection model	39,318	Prepurchase homeownership counseling delivered through classroom, home study, individual, or telephone	90-day delinquency rate	Borrowers who received counseling were 34% less likely to become 90 days delinquent. Correcting for selection bias showed statistically significant effects for classroom delivery of counseling services.
Moulton et al.	2015	Random assignment	425	Monitoring	Loan performance	10% improvement in loan performance for previously delinquent owners.
Quercia and Spader	2008	Quasi-experimental selection model	2,688	Prepurchase homeownership and education counseling	Mortgage loan prepayment and default	Counseling produced a statistically significant increase in probability of prepayment; no statistically significant increase in mortgage performance.
Shelton and Hill	1995	Descriptive comparisons of borrowers before and after counseling	35	Financial education for low- and moderate-income first-time homebuyers	Self-reported financial behaviors	50% increase in the proportion of participants who totaled the value of things they owned "all of the time" and the proportion of participants who compared their income and expenses "all of the time."
Smith, Hochberg, and Greene	2014	Random assignment	898	One-on-one versus group counseling	Obtaining loans and ownership	Individual counseling affected credit scores, total debt, and all types of delinquencies (not mortgage performance).
Turnham and Jefferson	2012	Descriptive comparisons of borrowers before and after counseling	573	Prepurchase homeownership and education counseling	Mortgage performance	After 12 months, 1 of the 200 clients purchasing a home within 18 months of receiving counseling services defaulted.

Sources: Collins and O'Rourke (2011); the authors

other pieces of work on the topic. This study, however, focused on outcomes affecting the potential for households to obtain home loans and homeownership rather than on the effect of counseling on loan performance after home purchase occurred. It found statistically significant effects of more extensive counseling on changes in credit scores, total debt, and delinquencies for all types of debt combined, but it not address mortgage delinquency or default.

A third paper (Moulton et al., 2015) tested a “low-touch” strategy of monitoring borrowers in the Ohio Housing Finance Agency’s first-time homebuyer program to remind them of their mortgage payments. The authors studied buyers randomly assigned to receive the treatment (primarily phone calls) or not (the nontreatment group received only an initial financial assessment), following them for a year after purchase. The random assignment deals directly with the challenges of selection bias among buyers choosing to participate in the monitoring/contacting program. The intervention is not literally prepurchase, however. The modeling also includes a modest set of credit measures (credit scores) and a common set of identical loan terms from the program. Principal findings are that this relatively limited intervention produced substantial reductions in delinquency for buyers who have had some history of delinquent payments—10 percentage points relative to a 15-percent average delinquency rate. For those with clean mortgage payment records, the intervention did not show a significant effect.

A fourth recent paper (Brown, 2015) tested the effects of prepurchase counseling on defaults and—unlike most previous studies—on foreclosures. The study found that prepurchase counseling, covering both purchase and dealing with postpurchase financial difficulties, had no significant effect on default rates but did have a large (42 percent) impact on reduced odds of foreclosure. The study of 732 mortgages, accompanied by downpayment assistance from the Tennessee Housing Development Agency and a counseling requirement, had the advantage of 7 years of tracking data in pursuing default and foreclosure outcomes. It took advantage of the “natural experiment” that the counseling requirement did not take hold for the first 6 months of the program, addressing some of the issues of selection bias. The author acknowledges, however, that the postrequirement buyers might differ from “early adopters” in such things as their patience for counseling, time preferences, and mortgage options. Most important from the point of view of this paper, the data set used only credit scores as a measure of past credit experience and practice. It is notable that empirical modeling results showed that credit scores had a very large effect on mortgage performance. This effect of the limited credit history measure suggests that if the precounseling-requirement borrower population differed in unobserved credit practice from those who entered later and received counseling, an important element of missing variables/selection bias could remain.

Overall, existing research shows a somewhat mixed but promising set of effects of prepurchase counseling, inviting further testing and methodological improvements to further address selection bias, including measures of homebuyers’ credit behaviors.

## **Data and Methods**

The data used in this study consist of information on 18,258 clients who received prepurchase counseling from NeighborWorks organizations at some point between October 2007 and September 2009 and who also purchased a home within this 24-month period. Experian (a credit

repository), using propensity scoring, selected a comparison group of 56,298 borrowers with similar observable characteristics to those of NeighborWorks prepurchase clients. We augmented information included in Experian's credit files with county-level data on unemployment rates and metropolitan statistical area (MSA)-level measures of changes to house prices.<sup>2</sup> With these data, we estimated a binomial logit model in which the dependent variable equals 1 for loans that are observed to *avoid* becoming 90 or more days delinquent within 24 months of loan origination.<sup>3</sup> In such a model, the estimates (odds ratios) reflect the effect of a one-unit change of an explanatory variable on the odds of observing a loan's avoiding becoming 90 or more days delinquent within 24 months of origination. Some previous studies have used a dependent variable valued at 1 for avoiding delinquency and others at 1 for becoming delinquent. The choice has no effect on the results of analysis as long as the reporting is clear, and we chose 1 for avoidance so that the expected effect of the policy variable—providing counseling—on the outcome is positive.

### Propensity-Scoring Comparison Group

Propensity scoring is a technique for developing a comparison group that closely matches the characteristics of those who received treatment. Those who obtain prepurchase homebuyer counseling, in general, and NeighborWorks network's counseling, in particular, are not a representative sample of all potential homebuyers. For example, most are first-time buyers, relatively young, and of modest income (see exhibit 2).<sup>4</sup> It is helpful on two counts to select a comparison sample that is similar to the set of counseled homebuyers on a variety of dimensions rather than to all buyers.<sup>5</sup>

First, although many variations between the counseled buyers and loans and a random sample of noncounseled loans would be controlled for in the subsequent logit modeling, large differences in the distributions of the control variables would reduce the efficiency of the model estimates. The issue of efficiency of the model estimates can be described as follows. Suppose that nearly all the counseled-borrower loans were to first-time buyers and almost all the noncounseled-buyer loans were to repeat owners. It would be very difficult (if not impossible) to separate statistically the effect of prepurchase counseling program on serious delinquencies from the effect of the past ownership history on delinquencies, because very few buyers of the same history would be in the different treatment groups. The problem, therefore, is not that we would get the *wrong* answer regarding counseling effects but, rather, that we would get *no answer at all*. By having counseled and noncounseled samples that are relatively similar on observable borrower and loan characteristics, our models will be more likely to separate program effects from other statistical "noise."

Second, choosing samples that are similar on observable characteristics likely reduces their dissimilarity along unobservable dimensions because they are likely correlated with one another.

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<sup>2</sup> State-level housing price data were used for locations outside MSAs.

<sup>3</sup> Logit models are used when the dependent variable is categorical and, thus, can take on a limited number of values. In this case, the model estimates the explanatory power of variables that results in the dependent variable's taking the value of 1.

<sup>4</sup> Note that the ratio of total credit outstanding to income is higher for borrowers who did not receive NeighborWorks counseling when compared with borrowers who did receive such counseling. This mean value is different across the two groups because it was not included in the propensity-scoring model. The difference is controlled for in the models that measure the impact of NeighborWorks counseling on loan performance by including the variable in the models' specification.

<sup>5</sup> See, for example, the use of propensity scoring in analysis of a similar outcome in Ding et al. (2011).

## Exhibit 2

### Descriptive Statistics for All Variables Included in the Logit Model by Comparison and NeighborWorks-Counseled Groups (1 of 2)

Variable Name	Variable Description	Comparison Group	NeighborWorks-Counseled Borrowers	All Borrowers
Dti	Ratio of total credit outstanding to income	0.6396	0.3690	0.5733
Ind	Indicator of borrower's receiving counseling	0.00	1.00	0.24
enhtype19	Indicator of FHA loan	0.40	0.42	0.41
income w/o over 200k	Income (excluding those of more than \$200,000)	58,309	55,941	57,730
Incomeclsq	Square of income	4,423,878,038	4,077,075,828	4,339,133,684
vantage cleaned	VantageScore	740	723	736.1271
yr 2008 loan	Year 2008 loan	0.3131	0.3055	0.3112
yr 2009 loan	Year 2009 loan	0.5231	0.5437	0.5281
jan 2008 unemployment rate; if no MSA could be matched, state is used; if county could not be matched, left blank	January 2008 unemployment rate; if no MSA could be matched, state is used; if county could not be matched, left blank	5.153	5.009	5.117
% change between jan 08 and jan 10 UE rate; an increase from 5% to 10% would produce a value of 100	Percent change between January 2008 and January 2010 unemployment rate; an increase from 5 to 10% would produce a value of 100	96.998803	99.398760	97.590895
Q1 2008 HPI, if no MSA could be matched, state is used; if county could not be matched, left blank	Q1 2008 HPI; if no MSA could be matched, state is used; if county could not be matched, left blank	240.076944	228.402819	237.196825
% change between Q1 08 and Q1 2010 HPI	Percent change between Q1 2008 and Q1 2010 HPI	- 10.402717	- 9.866913	- 10.270529
DTI2cl	Ratio of annual mortgage payment to income	0.2897	0.2740	0.2857
mtf_int_rate	Mortgage interest rate computed based on total mortgage payment	7.4182	7.5599	7.4529
ALL6250 recoded cleaned	Dummy for credit $\geq$ 90 days in 12 months since open	0.1087	0.1334	0.1147
OVERALL BTL OPEN TRD RP6	Balance-to-credit amount ratio on 6 months of trades	46.04	45.97	46.02
ALL7357D cleaned	Percent of trades $\geq$ 60 days in past 12 months	4.5344	4.2399	4.4625
ALX0436 cleaned	Total trades open in past 6 months	3.3597	2.8476	3.2343
TTL COL WBAL>250	Total external collections with balance > 250	0.28	0.21	0.26
TTL COL INQ IN 6M	Total external collect inquiries in past 6 months	0.06	0.07	0.06
TTL INQ IN 3M NO DEDUPE	Number credit inquiries in past 3 months	1.55	1.87	1.63

**Exhibit 2**

**Descriptive Statistics for All Variables Included in the Logit Model by Comparison and NeighborWorks-Counseled Groups (2 of 2)**

Variable Name	Variable Description	Comparison Group	NeighborWorks-Counseled Borrowers	All Borrowers
REV3422 cleaned	Total open revolving trades with balance/credit amount $\geq$ 75 reported in past 6 months	0.6296	0.5671	0.6144
chargeoff indicator (from ALL8164)	Chargeoff indicator	0.1474	0.1543	0.1491
indicator of past bankruptcy	Indicator of past bankruptcy	0.0737	0.0997	0.0801
mta0301	Dummy for NOT first-time buyer	0.14	0.13	0.14
indintractmta0301	Interaction between NOT first-time buyer and counseling	0.0000	0.1277	0.0313
Ext_Age	Borrower's age	39.88	37.78	39.61
N		56,284	18,258	74,542

FHA = Federal Housing Administration. HPI = housing price index. MSA = metropolitan statistical area. NeighborWorks = NeighborWorks® America.

Such a reduction in unobservables' differences reduces the likelihood and likely size of selection bias, which, if substantial, might produce a higher- or lower-than-accurate estimate of counseling's effects. Providing for a similar comparison sample is the first of the two methods we use to reduce such bias.

Instead of a random sample, we used Experian's comparison sample created by implementing a propensity-scoring model to align the characteristics of the counseled loans and noncounseled loans as closely as possible on several important dimensions. For each loan in the counseled sample, the propensity-scoring model found the three closest matches among the noncounseled loans in the Experian database.

Propensity scoring has been used in other evaluations of prepurchase counseling, including in Agarwal et al.'s 2009 study of the Indianapolis Neighborhood Housing Partnership's counseling program (Agarwal et al., 2009a).<sup>6</sup> Their primary purpose was to reduce selection bias, whereas we focus on both statistical efficiency and on reducing selection bias. NeighborWorks engaged Experian to construct the comparison group using its own databases. The propensity-scoring model that Experian used included the following variables.

- Total open trades (a trade is any type of credit account, such as a credit card or an auto loan).
- Total trades opened in past 6 months.

<sup>6</sup> The authors report that they attempted to use a borrower's physical and commute-time distance from a counseling location as an instrument that predicts whether a borrower entered counseling. This instrument did not predict group membership accurately enough to use in the final analyses.

- Total trades ever 60 or more days delinquent in past 24 months.
- Total balance of trades opened in past 6 months.
- Ratio of balance to credit amount, trades opened in past 6 months.
- Dummy for Florida.
- Dummy for California.
- Income (excluding those more than \$200,000).<sup>7</sup>
- VantageScore.<sup>8</sup>
- Mortgage amount.
- Total monthly house payment.
- Interest rate.
- Year 2008 loan.
- Year 2009 loan.
- Federal Housing Administration (FHA) loan.
- Repeat homebuyer.

Note that the borrower income and mortgage interest rate are not reported directly in Experian's database from income tax returns and mortgage documents. Experian estimated borrower income using a proprietary algorithm that uses all sources of income in Experian's files to determine which self-reported income value collected by Experian is most consistent and reliable. Where values are missing or no sources or reliable income sources are provided for a consumer, an income value is imputed based on an algorithm that applies an income value based on the information contained in other records with characteristics similar to those of the missing consumer (for example, realty, age, marital status, presence of children, occupation).

To impute the mortgage's interest rate, Experian used the total monthly payment associated with the loan (which may include escrow items such as property taxes and insurance), the loan amount, and the loan term (all three of these variables are in Experian's database) to calculate a mortgage's interest rate. Because Experian's database does not have information on just the monthly principal and interest payment, the imputed interest rate is not the same as the actual mortgage interest rate. Nonetheless, the imputed interest rate was used as a control in the propensity-scoring model as a best-available, but imperfect, substitute.

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<sup>7</sup> Only a few incomes are more than \$200,000, none are in the treatment group, and several are of very large values that appear to be errors. To avoid having a few observations dominate the analysis unduly, these observations were eliminated.

<sup>8</sup> A VantageScore is a generic credit score model developed by the three credit repository companies. With a range between 501 and 900, the score predicts the likelihood of future serious delinquencies (90 days late or greater) on any type of account. A consumer's score is based primarily on a 24-month review of a consumer's credit file. <http://www.vantagescore.com/about/vantagescoremodel/>.

Using the propensity-scoring method, Experian selected 56,298 borrowers who received their loans at the same time as the NeighborWorks clients (between October 2007 and September 2009). As shown in exhibit 3, the propensity-scoring method was successful, with average characteristics for the variables used in the propensity-scoring model just about the same as those for NeighborWorks clients and the comparison group members, with the exception of the total balance of trades opened in the past 6 months.<sup>9</sup>

**Exhibit 3**

**Means for Variables Used in Propensity-Scoring Model**

Variable	Comparison Group	NeighborWorks-Counseled Group	Total
Total open trades	13.4181	13.6778	13.4813
Total trades opened in past 6 months <sup>a</sup>	1.90	2.78	2.12
Total trades ever 60 or more days delinquent in past 24 months	0.8848	0.9060	0.8900
Total balance of trades opened in past 6 months	31,896	17,325	28,335
Ratio of balance to credit amount, trades opened in past 6 months	46.04	45.97	46.02
Florida <sup>b</sup>	0.0461	0.0421	0.0451
California <sup>b</sup>	0.1010	0.0907	0.0985
Income (excluding those of more than \$200,000)	58,309	55,941	57,730
VantageScore	740.5	722.9	736.1
Mortgage amount	133,124	128,880	132,084
Total monthly house payment	900	881	895
Interest rate	7.4182	7.5599	7.4529
Year 2008 loan	0.3131	0.3055	0.3112
Year 2009 loan	0.5231	0.5437	0.5281
FHA loan	0.40	0.42	0.41
Repeat homebuyer	0.14	0.13	0.14

<sup>a</sup> This variable differs slightly from the 6-month trades variable in exhibit 2 because of different treatment of authorized user trades.

<sup>b</sup> Experian actually used all state designations as part of the propensity scoring. We report here only the two states with largest numbers of delinquencies; additional results are available from the authors.

FHA = Federal Housing Administration. NeighborWorks = NeighborWorks® America.

**Logit Model of Performance**

Prepurchase counseling can have at least two types of effects on loan performance. The first is a direct effect, helping homebuyers with such matters as overall budgeting, managing their other borrowing on credits cards and elsewhere, and setting aside reserves for emergencies to enable them to make their regular mortgage payments. A second effect is helping homebuyers select a mortgage product that is affordable and otherwise appropriate, including gaining a desirable interest rate on the loan, given their credit rating and downpayment<sup>10</sup> and choosing a home at a price that makes mortgage payments a manageable fraction of income. That second element, product choice, may then affect mortgage performance, in part, because of counseling. Our modeling estimates the first, direct effect.

<sup>9</sup> Note that the intent of propensity scoring is not to produce exact matches. The dual purposes here are to increase the efficiency of model estimation by increasing overlapping of the treatment and control groups variables and to reduce the impact of missing variables, which may be correlated with the treatment variable.

<sup>10</sup> According to a recent survey of prepurchase counseling clients, 44 percent of clients enter counseling to find the most appropriate mortgage; see Turnham and Jefferson (2012).

We considered modeling the second effect as well and conducted some initial trial runs. Because of three limitations in the Experian data set, we cannot perform satisfactory analyses of counseling's effect on product choice. The first limitation: Experian's data does not include a direct measure of interest rate, the size of the mortgage payment alone (without escrowed taxes and insurance), or loan-to-value (LTV) ratio. The second limitation: by using information on the loan's payment and the imputed interest rate in the propensity-scoring model, Experian eliminated much of the variation in key indirect effects of counseling between counseled and noncounseled homebuyers. Re-doing the control sample was beyond the purview of this study. The third limitation: some people are referred to counseling, sometimes as a condition for financing, precisely because they are seeking certain types of mortgage products or levels of financial commitment, which complicates the assessment of the direction of causation between product choice and counseling.

Therefore, we focus our analyses on one central potential effect of counseling: that providing clients with information about being a homeowner, general budgeting, and financial management skills will result in better loan performance over time, holding other factors constant. The dependent variable is binary and takes the value of 1 if a loan *avoids* becoming 90 or more days delinquent at any point within 24 months of origination, regardless of when the loan was originated. (The data include loans originated in the fourth quarter of 2007, all of 2008, and the first three quarters of 2009.) Measurement is truncated at 2 years, and only loans made at least 2 years before the end of our observation period in the third quarter of 2011 are considered, so that each loan's performance is viewed during the same length of time.

Descriptions of the model's explanatory variables, as listed in the Description column of exhibit 4, follow.

- To identify potentially different effects of counseling for first-time homebuyers compared with repeat buyers, the prepurchase counseling intervention is measured by two explanatory variables. The first, *indicator of borrower receiving counseling*, is a dummy for whether NeighborWorks prepurchase counseling was provided to the borrower before the acquisition of the owner's current home. Its coefficient by itself measures the effect of counseling for first-time buyers. The second intervention variable, *interaction between repeat buyer and counseling*, is the product of dummy variables for counseling and for repeat buyers, and its coefficient potentially amends the estimated effect of counseling found for first-time buyer performance to estimate counseling effects for repeat buyers in particular.<sup>11</sup>
- The dummy variable for repeat buyers provides for measurement of whether repeat purchasers experience different mortgage outcomes than first-time buyers, aside from any difference in the effect of counseling.
- Income-related measurements of a buyer's ability to meet mortgage obligations, measured at the time of loan origination, include *annual income*; *square of income* (to allow for nonlinearity in income's effect on performance); *ratio of annual mortgage payment to income*, the conventional housing ("front-end") debt-to-income (DTI) ratio, including principal, interest, and taxes and

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<sup>11</sup> Receiving counseling is a dummy variable with a value of 1 or 0. Being a repeat buyer is also a dummy variable. The product of the two values (1 x 0, 1 x 1, 0 x 1, and 0 x 0) yields 0 three-fourths of the time and 1 in only one-fourth of situations in which the client is a repeat buyer and is being counseled.

**Exhibit 4**

**Variables Used in the Logit Model of Loan Performance**

Variable Name	Description
ind	Indicator of borrower receiving counseling
indintractmta0301	Interaction between repeat buyer and counseling
Dti	Ratio of total credit outstanding to income
enhtype19	Indicator of FHA loan
incomecl200k	Annual income (ignoring those of more than \$200,000)
incomeclsq	Square of income
vantageocl	Vantage credit score (500 to 990 is Experian's range for this variable)
yr2008	Loan originated in 2008
yr2009	Loan originated in 2009
UE08	County unemployment rate in Jan 2008
UEch0810	Change in unemployment rate Jan 2008 to Jan 2010
HPI08	Housing price index Jan 2008
HPIch0810	Housing price index change Jan 2008 to Jan 2010
DTI2cl	Ratio of annual mortgage payment to income
mtf_int_rate	Mortgage interest rate computed based on total mortgage payment
ALL6250cl	Dummy for credit $\geq 90$ days in 12 months since open
ALL7110	Balance-to-credit amount ratio on 6 months of trades
ALL7357Dcl	Percent of trades $\geq 60$ days in past 12 months
ALX0436cl	Total trades open in past 6 months
COL3210	Total external collections with balance $> \$250$
IQC9416	Total external collections inquiries in past 6 months
IQT9425	Number of credit inquiries in past 3 months
REV3422cl	Total open revolving trades with balance/credit amount $\geq 75$ reported in past 6 months
Chargeoff	Whether a chargeoff
ALL9220bkrptcyind	Whether a bankruptcy
EXT_AGE	Age of borrower
mta0301	Dummy for NOT first-time buyer

FHA = Federal Housing Administration.

insurance when paid into escrow; and *ratio of total credit outstanding to income*, a modified form of “back-end” all-debts DTI employed by Experian, using the stock amount of credit rather than the flow of debt repayments as its numerator, which is the more standard method of calculating DTI.

- *Vantage credit score* (ranging 500 to 990) at time of loan origination.
- Ten measures of the homebuyer's credit history and experience, with time of observation looking backward from the time of loan origination.
  1. A dummy for whether the buyer has been delinquent 90 or more days on one or more credit trades in 12 months since the trades were opened (*dummy for credit  $\geq 90$  days in 12 months since open*).
  2. Overall balance-to-credit amount ratio on open trades reported in the past 6 months (*balance-to-credit amount ratio on 6 months of trades*).
  3. Percentage of trades 60 days or more delinquent or derogatory in the past 6 months (*percent of trades  $\geq 60$  in past 12 months*).
  4. Total number of trades open in the past 6 months (*total trades open in past 6 months*).

5. *total external collections with balance > \$250.*
  6. *total external collections inquiries in the past 6 months.*
  7. *number of credit inquiries in past 3 months.*
  8. Total open revolving trades with a balance-to-credit amount ratio at or above 75 percent reported in the past 6 months (*total open revolving trades with balance/credit amount  $\geq$  75 reported in past 6 months*).
  9. Whether the homebuyer has ever had a credit charged off as uncollectible (*whether a chargeoff*).
  10. Whether the homebuyer has ever experienced a bankruptcy (*whether a bankruptcy*).
- Other loan and borrower characteristics: *indicator of FHA loan, mortgage interest rate computed based on total mortgage payment,<sup>12</sup> and age of borrower.*
  - Measures of housing market conditions include MSA (or state for nonmetropolitan-area mortgages) housing price indices (*housing price index Jan 08*) and changes in them during 2 years (*housing price index change Jan 2008 to Jan 2010*), as provided by the Federal Housing Finance Agency.
  - Unemployment measures *county unemployment rate in Jan 2008* and *change in unemployment rate Jan 2008 to Jan 2010* provide a rough proxy for the likelihood that borrowers have lost jobs and income since loan origination.
  - Dummy variables for *loan originated in 2008* and *loan originated in 2009*, respectively, represent changing underwriting standards and economic conditions affecting loan performance, with origins in 2007 being the excluded category.

Note that, in a minority of counseling cases, NeighborWorks' partners may provide additional services to the buyers with whom they work, including lending and broker services. It would be desirable to have variables representing those other services to avoid biasing the effect of counseling alone. NeighborWorks unfortunately did not include that information in the counseling file provided to us for the period under study. A bias may be most likely if NeighborWorks-provided loans were on sharply advantageous terms compared with other loans, sufficient to help prevent serious delinquencies. The data we have for first-time owners in the 2008-to-2009 period suggest limited bias. Only 12 percent of new homeowners received NeighborWorks loans that were forgivable or had deferred payments, and only 15 percent received any loan from NeighborWorks funds. Furthermore, we have a separate control for the ratio of mortgage payment to income, separately accounting for any advantage in mortgage burden a NeighborWorks loan may provide. In addition, we do not know that counseling was tightly correlated with loan assistance.

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<sup>12</sup> As indicated in the Methods and Data section, in discussion of product choice, Experian data do not actually include a lender-reported interest rate. Experian computed an "interest rate" based on total mortgage payment, often including property taxes and insurance if they are paid into escrow accounts with lenders/servicers; loan term; and loan amount at origin. Using the total mortgage payment, together with the mortgage amount and term, overestimates the interest rate. Because these extra costs (property taxes and insurance) are included in that payment, the variable inherently overstates the interest rate. We tested whether this variable nonetheless had value in comparing borrowers, including it in the logit analysis even though it often overstates actual rates.

## Findings

The findings of our mortgage-performance model analysis are summarized in exhibit 5. The exhibit shows the parameter estimate, odds ratio, and *p*-value for each variable. In interpreting the results, we focus on two factors: the odds ratio and the *p*-value. The odds ratio reflects the effect of a one-unit change of the explanatory variable on the odds of a borrower's not having a loan become 90 or more days delinquent within 24 months of origination. Therefore, a variable that has an odds ratio of greater than 1.0 means that a one-unit change *increases* the odds of having a borrower not become delinquent on his or her loan. Conversely, an odds ratio of less than 1.0 means that a one-unit change to the explanatory variable *decreases* the odds that a borrower will avoid becoming 90 or more days delinquent on his or her mortgage within 24 months of origination.<sup>13</sup>

### Exhibit 5

Parameter Estimates of the Logit Model of Loan Performance With Prior-Use-of-Credit Variables

Variable	Parameter Estimate	p-Value	Odds Ratio
Indicator of borrower's receiving NeighborWorks counseling	0.411	0.000	1.51
Interaction between first-time buyer and counseling	- 0.021	0.900	0.98
Ratio of total credit outstanding to income	- 0.001	0.909	1.00
Indicator of FHA loan	- 0.520	0.000	0.59
Annual income (ignoring those of more than \$200,000) (\$000s)	0.010	0.000	1.01
Square of income (\$000s)	0.000	0.001	1.00
Vantage credit score (500 to 990 is the score's range)	0.010	0.000	1.01
Loan originated in 2008	0.436	0.000	1.55
Loan originated in 2009	0.895	0.000	2.45
County unemployment rate in Jan 2008	- 0.006	0.749	0.99
Change in unemployment rate Jan 2008 to Jan 2010	- 0.001	0.154	1.00
Housing price index Jan 2008	0.001	0.000	1.00
Housing price index change Jan 2008 to Jan 2010	0.027	0.000	1.03
Ratio of annual mortgage payment to income	- 0.877	0.000	0.42
Mortgage interest rate computed based on total mortgage payment	0.074	0.000	1.08
Dummy for credit ≥ 90 days in 12 months since open	- 0.111	0.038	0.90
Balance-to-credit amount ratio on 6 months of trades	- 0.004	0.000	1.00
Percent of trades ≥ 60 days in past 12 months	- 0.001	0.439	1.00
Total trades open in past 6 months	- 0.026	0.000	0.97
Total external collections with balance > \$250	- 0.032	0.045	0.97
Total external collections inquiries in past 6 months	- 0.058	0.187	0.94
Number of credit inquiries in past 3 months	- 0.124	0.000	0.88
Total open revolving trades with balance/credit amount ≥ 75 reported in past 6 months	- 0.010	0.481	0.99
Whether a chargeoff	- 0.244	0.000	0.78
Whether a bankruptcy	- 0.321	0.000	0.73
Age of borrower	- 0.003	0.064	1.00
Dummy for not first time buyer	- 0.291	0.000	0.75
Constant	- 3.698	0.000	0.02

FHA = Federal Housing Administration. NeighborWorks = NeighborWorks® America.

<sup>13</sup> Note that odds are not the same as probability; odds are calculated by dividing the probability (*p*) by 1 minus the probability, or *p*/(1-*p*). Therefore, in the case where the probability that an event will occur is 25 percent, the odds are 0.25/(1-0.25) = 0.33. Assume, for example, that the odds that an event will occur are 0.33 without counseling but are 0.25 with counseling. The odds ratio between those events happening without and with counseling is 0.33/0.25 = 1.32.

The second factor we use in interpreting the results is the *p*-value for each variable. In most statistical analyses, the null hypothesis is that a parameter estimate is equal to 0. In this context, the null hypothesis is that an explanatory variable has no effect on loan performance. The standard used in most studies is to reject this hypothesis and conclude that the explanatory variable has an effect on loan performance if the *p*-value is less than .05. Therefore, a parameter estimate with an odds ratio that is greater than 1.0 and a *p*-value of less than .05 can be interpreted as a factor that has a positive effect on loan performance.

The coefficient for the basic NeighborWorks counseling indicator impact on *avoiding* serious delinquency and default is positive and highly statistically significant (the *p*-value is .000, well below the .05 threshold), with a substantial odds ratio of more than 1.5. First-time buyers who obtain counseling achieve significantly better loan performance than do comparable buyers without counseling during the important first 2 years of their loans.

The coefficient of the interaction between counseling and being a repeat buyer is not at all statistically significant.<sup>14</sup> First-time buyers and repeat buyers both receive the same substantial benefit from counseling, measured by the counseling indicator's coefficient and odds ratio.

Note that we attempted to estimate separate models for first-time and repeat buyers, thinking that their performances might be different in reaction to a variety of variables in addition to counseling. The number of repeat buyers, however, at 1/7 of the counseled total, is small enough that, when we did then differentiate between people counseled and those not and then look at the cases in which 90-day delinquencies occur, the number is too small to allow for stable separate modeling. Including the interaction between counseling and repeat buyers in our single model enables us to isolate our key concern about counseling while retaining sufficient sample size to estimate the model effectively.

Because it is difficult to interpret odds ratios, we used the model's parameter estimates and population means to translate that metric into the probability of loans becoming 90 or more days delinquent within 24 months of origination with and without NeighborWorks prepurchase counseling. We calculated separate probabilities for loans originated in 2007, 2008, and 2009 for clients who were not first-time homebuyers. The results of those simulations are presented in exhibit 6. The estimates are made with continuous variables at their mean values and dichotomous variables at their mode, as is standard procedure.

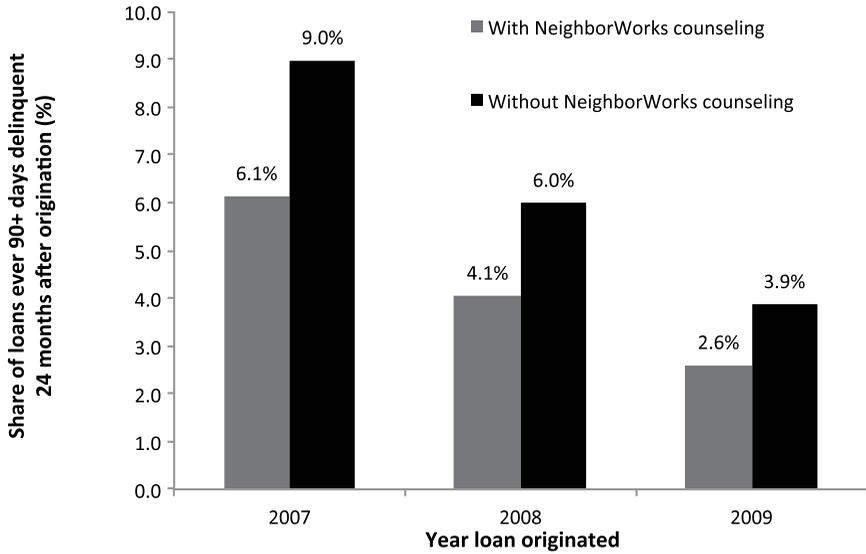
We also estimated the share of loans that become 90 or more days delinquent for first-time homebuyers only. Exhibit 7 graphically presents these findings, which are very similar to the estimates for all borrowers in the sample.

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<sup>14</sup> As Norton, Wang, and Ai (2004) have pointed out, the interaction's impact in a nonlinear regression structure such as logit is not simply the coefficient of the single interaction term. We computed the proper interaction and significance test using the procedure Norton, Wang, and Ai lay out.

**Exhibit 6**

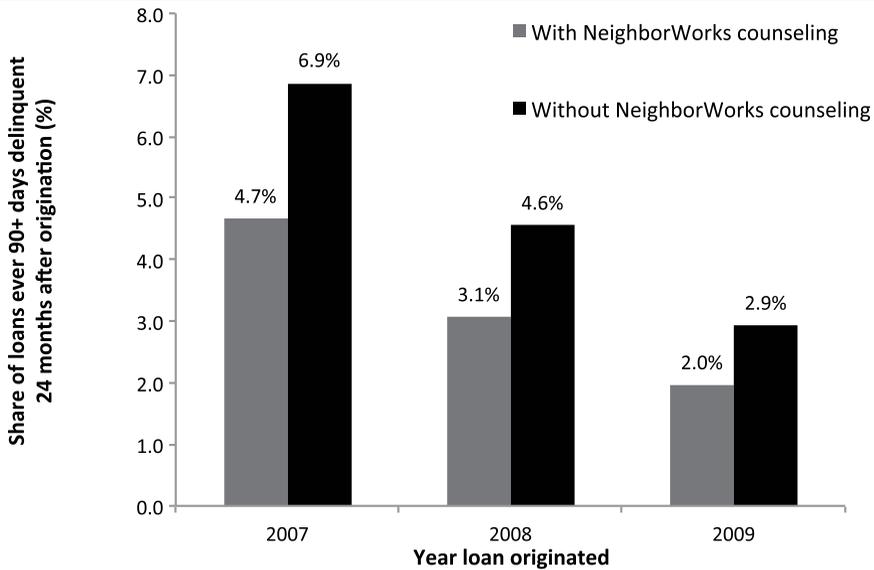
Estimated 90-or-More-Days Delinquency Rates for Repeat Homebuyers With and Without NeighborWorks Prepurchase Counseling



NeighborWorks = NeighborWorks® America.  
Source: Authors' analyses of logit model parameter estimates

**Exhibit 7**

Estimated 90-or-More-Days Delinquency Rates for First-Time Homebuyers With and Without NeighborWorks Prepurchase Counseling



NeighborWorks = NeighborWorks® America.  
Source: Authors' analyses of logit model parameter estimates

The estimates of counseling's effects show a one-third reduction in the share of loans for prepurchase clients who are 90 or more days delinquent when compared with borrowers who receive no such services (exhibit 8). The results are highly consistent across years, despite the strong shocks to the mortgage market in this period.<sup>15</sup> Given the results of the logit analysis, the findings are nearly identical for first-time and repeat buyers.

This reduction in the delinquency rate (using an approach that reduces potential selection bias issues) is consistent with studies conducted by Hiran and Zorn (2002) and Agarwal et al. (2009a) that reported declines in delinquency of 34 and 30 percent, respectively. They are also similar in magnitude with the findings of Avila et al. (2013) for first-time homeowners, although not for repeat buyers.

Model parameter estimates other than the counseling variables, as reported in exhibit 5 make sense and have important implications of their own. A lower housing DTI ratio produces significantly lower odds (0.42) of a serious delinquency. Should it be the case that NeighborWorks prepurchase counseling leads homebuyers to take on lower housing payments relative to income, counseling could have an additional substantial effect by way of DTI. Although, as we discuss in the Data and Methods section, various circumstances left us unable to model successfully the effect of counseling on mortgage product choice, including DTI, additional research might be fruitful in pursuing that connection.

Higher credit score has positive and significant link to performance. All 10 of the coefficients of measures of past high level of use and misuse of credit have the expected negative signs for impact on avoiding serious delinquencies and defaults, and 7 of them are statistically significant. These measures seem to well represent the characteristics of homebuyers/mortgage borrowers in terms of their knowledge of, approach to, and ability to manage credit. Past difficulty with credit use is a good predictor of future mortgage performance.

## Exhibit 8

### Estimated Share of Loans That Are 90 or More Days Delinquent Within 24 Months of Origination With and Without NeighborWorks Prepurchase Counseling

	Year Loan Originated		
	2007 (%)	2008 (%)	2009 (%)
<b>First-time homebuyers</b>			
With NeighborWorks counseling	4.7	3.1	2.0
Without NeighborWorks counseling	6.9	4.6	2.9
Difference	- 2.2	- 1.5	- 1.0
% decline	- 32.2	- 32.7	- 33.1
<b>Repeat borrowers</b>			
With NeighborWorks counseling	6.1	4.1	2.6
Without NeighborWorks counseling	9.0	6.0	3.9
Difference	- 2.8	- 1.9	- 1.3
% decline	- 31.7	- 32.4	- 32.9

NeighborWorks = NeighborWorks® America.

Source: Authors' analyses of logit model parameter estimates

<sup>15</sup> We estimated separate equations for each year, with very little variation in the impact of counseling.

Most importantly for our focus on the effects of NeighborWorks prepurchase counseling, inclusion of these 10 measures of what are, in many studies, the “unobservables” about household ability to handle credit by no means eliminates the separate effect of counseling. It is not the case that the effect of counseling disappears after we control for people’s measured past ability to handle credit. That might have been the case after we introduced the strong measures of credit history, if any perceived effect of counseling is actually the result of selection bias. That bias could occur in the case in which credit-savvy homebuyers are the people who—because of their savvy—both more frequently choose counseling (perhaps to gain access to homebuying financial assistance) and perform better with their mortgages, with counseling itself making no difference while personal approach to credit does. Because this selection bias issue has been so critical in questions about the validity of previous research on counseling effect, we shall return to it in the next section.

Income shows very little effect, even as measured in thousands of dollars. The results suggest that lower-income households can avoid serious mortgage trouble as well as other households can, if they are comparable in terms of past credit behaviors, current DTI ratios, and other factors. People obtaining FHA loans are faring much worse than others, for reasons we have not explored in this study. Performance is substantially better for people with more recent loan origination dates, which may well reflect—by 2008 and 2009—tightened underwriting standards and the sharp reduction in the payment-option adjustable-rate mortgage (ARM) and other types of loans that have proved hazardous to buyers. We were surprised to find that repeat buyers generally were more likely to suffer serious delinquencies than were first-time buyers, even while that distinction had no effect on the impact of counseling. We were also surprised to find that buyers with higher interest rates are more likely to avoid delinquency. Perhaps the imprecision in measuring that variable by imputation from total escrow payments has an effect on that variable, but we do not know for certain.

Our available measures of housing market conditions show statistically significant but limited-scale impacts, with worse housing price declines pulling down mortgage performance at least modestly. The unemployment variables, available only at county level when we would ideally have household-level measures, show no significant effect. Finally, the large odds ratios for the dummy variables indicating whether a loan was originated in 2008 or 2009 may reflect improved underwriting standards used by lenders after the financial crisis started in 2007.

Analysts think that issues related to selection bias have until now made it difficult to reach any conclusions about counseling’s effect. To illustrate this problem, Collins and O’Rourke (2011) posit that counseling clients are of two potential types: (1) those with a high financial capability with a high degree of future motivation and so have a strong credit profile and (2) people with low financial capability who are present-oriented and so have a weak credit profile. In previous studies, measures of financial capability generally have not been available, so that these unobserved financial-management skills may link entrance to counseling and good mortgage performance and may bias estimates of counseling’s own effects. If people with high financial capability consistently choose to enter counseling compared with others, analysis may overstate counseling’s effect; and if people with low financial capability recognize that and systematically seek out counseling, analysis may understate counseling’s effect.

The inclusion in this study of 10 credit management indicators, however, should capture the degree of a client’s financial capability, orientation toward future economic well-being, and related

elements and thus should minimize the bias. The methods used provide for this reduced bias both through inclusion of credit measures in the logit analysis and their earlier inclusion, for some identical and some similar variables, in the propensity scoring. The logit analysis—with its inclusion of an array of measures that actualize concepts of financial knowledge, savvy, judgment, and discipline—shows strong evidence that NeighborWorks prepurchase counseling has an independent effect on mortgage performance. If entrance to counseling were acting only as a proxy for characteristics that both drew people to counseling and helped them avoid mortgage trouble, our inclusion of Experian credit data variables as extensive controls should have wholly or largely eliminated counseling's estimated effects. In fact, they remain very substantial.

We undertook a further test for selection bias. If counseled buyers are in fact self-selecting to be counseled because they are also more adept in handling credit, then eliminating all the credit history and performance variables from the basic model should *increase* the apparent estimated impact of the retained counseling indicator variables. We tested this possibility by rerunning the performance model, dropping all 10 of the credit variables. The results are in exhibit 9.

## Exhibit 9

### Parameter Estimates of Logit Model of Loan Performance Without Prior-Use-of-Credit Variables

Variable	Parameter Estimate	p-Value	Odds Ratio
Indicator of borrower's receiving NeighborWorks counseling	0.376	0.000	1.46
Interaction between first-time buyer and counseling	- 0.121	0.420	0.89
Ratio of total credit outstanding to income	- 0.014	0.151	0.99
Indicator of FHA loan	- 0.570	0.000	0.57
Annual income (ignoring those of more than \$200,000)	0.000	0.000	1.00
Square of income	0.000	0.001	1.00
Vantage credit score (500 to 990 is the score's range)	0.012	0.000	1.01
Loan originated in 2008	0.491	0.000	1.63
Loan originated in 2009	0.921	0.000	2.51
County unemployment rate in Jan 2008	- 0.024	0.146	0.98
Change in unemployment rate Jan 2008 to Jan 2010	- 0.002	0.020	1.00
Housing price index Jan 2008	0.001	0.000	1.00
Housing price index change Jan 2008 to Jan 2010	0.024	0.000	1.02
Ratio of annual mortgage payment to income	- 0.914	0.000	0.40
Mortgage interest rate computed based on total mortgage payment	0.060	0.000	1.06
Age of borrower	- 0.005	0.000	1.00
Dummy for repeat buyer	- 0.362	0.000	0.70
Constant	- 5.626	0.000	0.00
Total trades open in past 6 months	- 0.026	0.000	0.97
Total external collections with balance > \$250	- 0.032	0.045	0.97
Total external collections inquiries in past 6 months	- 0.058	0.187	0.94
Number of credit inquiries in past 3 months	- 0.124	0.000	0.88
Total open revolving trades with balance/credit amount ≥ 75 reported in past 6 months	- 0.010	0.481	0.99
Whether a chargeoff	- 0.244	0.000	0.78
Whether a bankruptcy	- 0.321	0.000	0.73
Age of borrower	- 0.003	0.064	1.00
Dummy for not first time buyer	- 0.291	0.000	0.75
Constant	- 3.698	0.000	0.02

FHA = Federal Housing Administration. NeighborWorks = NeighborWorks® America.

Our findings are just the opposite of those suggested by the notion of strong positive selection bias. The coefficient of our counseling indicator *declines* modestly in the revised model relative to that in our basic analysis. The odds ratio goes from 1.51 to 1.46 for the basic first-time buyer indicator. The coefficient for interaction for repeat buyers remains not significant. Both first-time buyers and repeat buyers are perceived to benefit less, not more, when the credit characteristics are not used in the model. Letting people's self-selection biases go uncontrolled in the model does not create a false increase in the perceived effect of counseling at all.<sup>16</sup>

It is further instructive regarding selection bias to look back at some of the specifics of the set of 10 credit-history-and-performance variables we have included in our analysis. Suppose we had only one measure: whether a buyer underwent bankruptcy in the past. Then—if we were hunting for selection bias—we might suspect that such a buyer could be chastened about credit use and also perceive a need for counseling; for example, to escape the stigma of bankruptcy that lenders would use to decline financing. This newly careful borrower might be more likely to go to counseling and to perform well on his or her mortgage—creating a version of selection bias in which counseling seemed to correlate with good performance but was not necessarily the cause of improved performance.

Our analysis shows that the buyers with bad credit history perform worse on their new home mortgage, not better. Furthermore, this chastened borrower's changed behavior should be showing up in, and controlled for by, our host of other measures of recent credit management behavior besides bankruptcy. Alternatively, suppose we assume that our buyer with a past bankruptcy was singularly stubborn both about taking bad risk-management behaviors and refusing to go to counseling, leading to a false conclusion that lack of counseling produced poor mortgage performance. It might be argued that we do not have a measure of this "stubbornness" trait that might connect bad performance and nonreceipt of counseling, at least within the bankruptcy indicator itself. We do have, however, controls for this persistent behavior/attitude among our 10-variable (plus credit score) package. Although the bankruptcy indicator measures whether one ever occurred for this buyer, we have numerous other credit-performance measures that control for behavior in the past 3, 6, 12, and 24 months. The bad-credit recidivist will be very much identified and his characteristics controlled.

Our research data do have some weaknesses that may produce other selection or missing variables bias. We lack a precise measure of interest rates and any measure of LTV ratio, we do not know the payment period or downpayment terms, and we lack individual client data on noncounseling

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<sup>16</sup> A common method for dealing with selection bias in measuring interventions' impacts more broadly is to use instrumental variables that predict whether a person seeks treatment but that do not influence the outcome of interest. In a recent analysis of foreclosure-prevention counseling (Collins and Schmeiser, 2010), the authors measured an organization's outreach advertising in Chicago as an instrumental variable that predicts entry into counseling but does not affect outcomes for clients who receive counseling, to good effect in their work. The results of this analysis suggest that the factors influencing selection into counseling affect outcomes negatively. A similar instrumental variable approach unfortunately does not work here. We are analyzing counseling across many different cities, and we do not know when particular NeighborWorks organizations made outreach efforts that would influence selection into counseling nor that any such outreach for prepurchase counseling would have a sufficiently substantial effect to serve as an effective instrument. Moreover, we do not have an alternative instrumental variable available that would be correlated with the decision to enter counseling but not to the mortgage outcomes that concern us. We believe that our ability to directly operationalize and measure financial capability by looking at past credit behavior and performance provides a powerful and certain tool for handling selection bias in this kind of intervention.

assistance received from NeighborWorks. Any of these variables might be correlated with entrance into counseling, particularly because some NeighborWorks members do counsel buyers on loan selection and, thus, bias positively or negatively the computed effect of counseling.

## **Conclusion**

Our analysis demonstrates clearly that NeighborWorks network's prepurchase counseling and education have a substantial effect on the performance of mortgages for home purchase. Counseling produces a consistent one-third reduction in serious delinquency during the 2 years following origination. The effect is the same for both first-time buyers and previous homeowners.

Although we do not have the ability to detail exactly what counseling and education information and advice were key to the reduced delinquency, it is reasonable to assume—based on counseling topics—that counselors helped homebuyers avoid such pitfalls as taking on too much debt relative to income, being surprised by interest rates rising over time on nonfixed rate mortgages, and failing to understand and make provision for the true full costs of mortgage loans and homeownership. NeighborWorks counseling's mix of assistance to homeowners no doubt included the avoidance of deceptive mortgage practices that were so widespread in the period preceding our analysis of mortgage performance.

The finding is consistent with evidence from other research on the same topic. It breaks crucial new ground in dealing directly with the possibility that bias was being introduced into those estimates by the role of unobservable financial capabilities of borrowers. We were able to employ strong operational measurements of previous “unobservables” to control for homebuyers' capacity to handle credit. We find that NeighborWorks prepurchase counseling retains—indeed increases—its substantial independent effect when such measures are included in the analysis.

Our data, and thus our models, also leave out some important variables, including important loan terms such as LTV ratio. It would be highly desirable to develop data that include both the financial variables we had access to and the stronger loan characteristics that some other researchers have been able to assemble.

Our work also breaks important ground in examining counseling taking place throughout the United States by a large number of separate nonprofit organizations, rather than in a single place or organization. At the same time, that the NeighborWorks' network has common counseling standards provides for some consistency in the counseling services provided. Further work on the role of the nature of the counseling could well be a fruitful future direction for research.

It is possible that NeighborWorks prepurchase counseling's effect is still larger than we have estimated. Two directions deserve additional attention. First, our data constrained us to focus on counseling's impacts on serious delinquency during only the first 2 years of mortgage lives. NeighborWorks does not have satisfactorily precise homebuyer-level data for counseling activity before 2007, and we looked at originations for the 2007-to-2009 period to obtain an adequate sample size. Experian data available at the time for the research ran only to later 2011 so that only 2 years

of data could be consistently provided. To the extent that counseling reduces delinquencies during longer periods of observed loan performance, it may be worthwhile to measure counseling's effect for more than 24 months.

Another issue of timing and the size of NeighborWorks counseling's effect is the nature of the mortgage market in the particular years under study. In reaction to the mortgage crisis, lenders largely stopped making subprime loans and specific types of exotic mortgages during the period. Counseling may have been more important in protecting counseled households from default in periods in which mortgage products, underwriting, and other lending market conditions were less constrained by recent events.

In addition, the issue of counseling's effect on product choice and then of product choice's effect on mortgage performance deserves further investigation. We have seen in our modeling that at least the ratio of housing payment to income has a major effect on mortgage performance. Interest rates properly measured may have such an effect as well. If, at least at certain times in the mortgage market, counseling substantially affects people's choice in size and cost of mortgage in relation to their incomes and also the choice of riskiness of the product to the consumer (for example, payment-option ARMs), then counseling may affect mortgage performance additionally through mortgage choice. Additional thinking about how to structure modeling and obtain data to examine the product-choice issue could well be worthwhile in assessing prepurchase counseling's total effects.

## Authors

Neil S. Mayer is Principal at Neil Mayer & Associates.

Kenneth Temkin was Principal at Temkin Associates. Sadly, Ken died suddenly while the authors were finishing this article. His great head and heart both will be missed.

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