



HOW MUCH SHOULD WORKERS SAVE FOR EMERGENCIES?

Introducing the HelloWallet Emergency Savings Methodology

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March 2015

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Introduction

Emergency savings are a critical component of financial wellness. HelloWallet has previously found, for instance, that workers are more likely to withdraw money prior to retirement when they lack sufficient emergency savings.¹ Further, many bankruptcies are the result of families being unable to come up with relatively small sums of money for health-care or other financial shocks.² Also, without readily accessible savings, workers can accumulate overwhelming credit card debt when handling emergency expenses.³ Despite the importance of savings to financial health, there is no commonly accepted methodology to determine how much an individual or family might need in case of an emergency.⁴ Estimates in popular consumer finance literature range from a few months to almost a year of take-home income – but there seems to be little or no science behind these recommendations. And, we are not aware of any emergency savings recommendations that are personalized for different financial circumstances.

To address this gap, we propose a methodology for determining a personalized emergency savings target for most workers. We base this estimate largely on HelloWallet users' data. These data include millions of daily transactions that have accumulated among our members in their checking or credit card accounts over time. We can use these data to observe spending on different types of emergencies as well as variations in spending over time and deviations from normal spending. For instance, most workers live on a fixed and repetitive income stream, which is largely devoted to fixed expenses, like rent or mortgage. When an emergency strikes, however, there is a deviation from this trend. We can also observe spending on repairs such as payments to a roofing company or an auto repair shop.

These recommendations are designed to provide information on the amount of savings needed to face different kinds of shocks. For minor emergencies, we advise our users to keep enough money on hand to be able to pay for most of the car and home repairs we observe in our data, as well as to be able to meet their health deductibles. For major emergencies, we advise our users to save enough to cover one of the following: an unusual, but high-cost, car or home repair, or their maximum out-of-pocket healthcare costs. To protect against job loss, we recommend that everyone should be able to cover their expenses for a year, taking other sources of income into account. With this information, our users will be able to better understand the costs of different kinds of emergencies, and assess their ability to cope with these emergencies. Of course, users will have different risk preferences and incentives in terms of how much they want to prioritize building their emergency savings and for which emergencies they wish to prepare.

About HelloWallet

HelloWallet is an independent, online and mobile financial wellness software application. Companies that provide the software employ over 2.5 million workers. Collectively these workers approximate the age and income distribution of the U.S. workforce. They also represent most major industries in the U.S. economy. The software aggregates members' transactional level bank account information from thousands of different financial institutions. With these data, the software measures daily changes in savings deferrals, spending levels, debt payments, and any other financial observation captured in bank account transactions. The software also sends automated guidance to workers when their financial conditions change or as needed by the member.

The HelloWallet Emergency Savings Methodology

Three Levels of Emergency Savings

The HelloWallet emergency savings methodology is built on three types of observed emergency expenses, which we refer to as minor emergency expenses, major emergency expenses, and job loss expenses. Minor expenses are the most common economic shocks, but the economic impact of these emergencies is largely, although not entirely, fleeting. Major expenses are less frequent, but can carry punishing economic costs. Finally, covering expenses after a job loss can require very high levels of savings, even after accounting for unemployment insurance.

There are a few reasons why we elect to break up emergency expenses into these different categories. First, we find that emergency expense costs and frequencies cluster in these three groupings. Second, these three groupings provide a clear way to communicate to workers the costs of different kinds of emergencies. Finally, these three groupings provide a useful framework for motivating continuous efforts by the advisee to save. About half of workers do not have enough savings to cover even minor emergency expenses.⁵ Rather than start them down a path of saving for the most unlikely and most expensive emergency, we believe that saving for more likely and less expensive emergencies builds confidence among members. Each of these emergencies is explained in more detail below.

Minor Emergencies

Our minor emergency recommendation is based on workers having enough money to safely cover *all* of the following in a given year: minor car repairs, minor home repairs, and healthcare deductibles. HelloWallet data suggest that workers should prepare to cope with multiple minor emergencies around the same time period, given the frequencies of these emergencies and the compounding effect they can have. For example, a minor car accident can lead to an unexpected health deductible cost. The specific amount recommended for each worker depends on whether the advisee has any dependents, owns a home, owns a car, and the amount of their health insurance deductible. In general, based on the analysis discussed below, we recommend \$750 in reserves for advisees with a car, an additional \$1,800 in reserves for advisees with a home, and enough money to cover health insurance deductibles, which range depending on the plan someone has and the number of people covered by the plan. Our minor emergency recommendations are summarized in Table 1.

Minor Car Emergencies

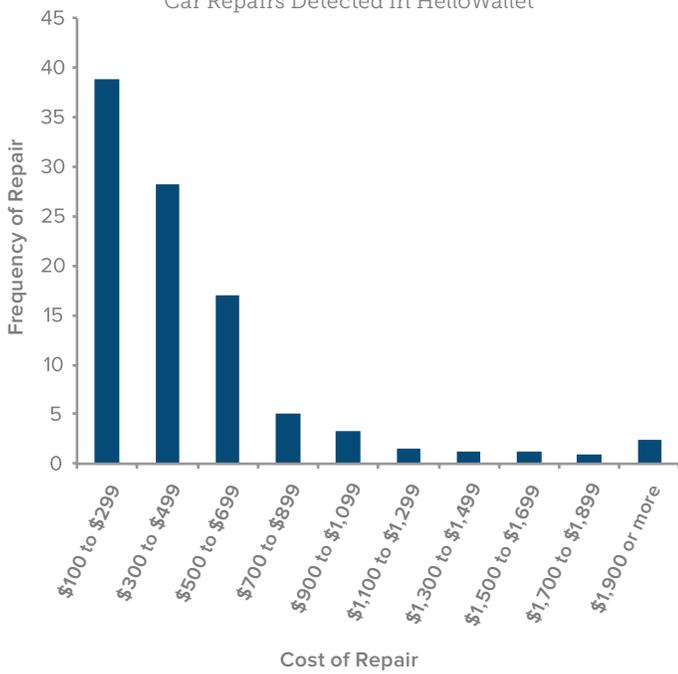
Unexpected car expenses can include flat or worn tires, fender-benders, mechanical or electronic equipment failures, and any number of related expenses. To assess an appropriate amount for workers to save for these types of unexpected expenses, we plotted all of the observed car related expenses in our database to examine the frequency of different costs for car repair. We found that car repair costs exhibit

Table 1: : Example of Minor Emergency Recommendation Calculation

Type of Emergency	Individual Who Doesn't Own Home or Car	Individual With Car	Family With Car and Home
Car	\$0	\$750	\$750
Home	\$0	\$0	\$1,800
Health	\$1,300	\$1,300	\$2,600
Grand Total	\$1,300	\$2,050	\$5,150

Note: For the purposes of this example, we assume that the family or individual have high-deductible health plans with the minimum deductible to quality as such.

Figure 1: Cost and Frequency of Car Repairs Detected in HelloWallet



Note: We do not include expenses below \$100, because we assume they are routine maintenance, such as oil changes.

a good deal of skewness, with half of repairs costing less than \$225 and an average cost of \$360 as shown in Figure 1.⁶ These data seem broadly consistent with publicly available data we can find on car repairs.⁷ For example, CarMd.com claims the average cost of a car repair has hovered between \$334 and \$422 over the last decade.

We then considered how unexpected car expenses were related to income and age. It could be, for instance, that higher-income workers systematically face more expensive car expenses because they have more expensive cars than lower-income workers. In this case, we would want to recommend that higher-income households save more than lower-income households. The data suggest this is not an important concern. In particular, we found that for every \$1,000 increase in household income, car repair bills increased by only \$.68, holding age constant. Similarly, these variables explained less than 2 percent of the variation in repair costs.⁸

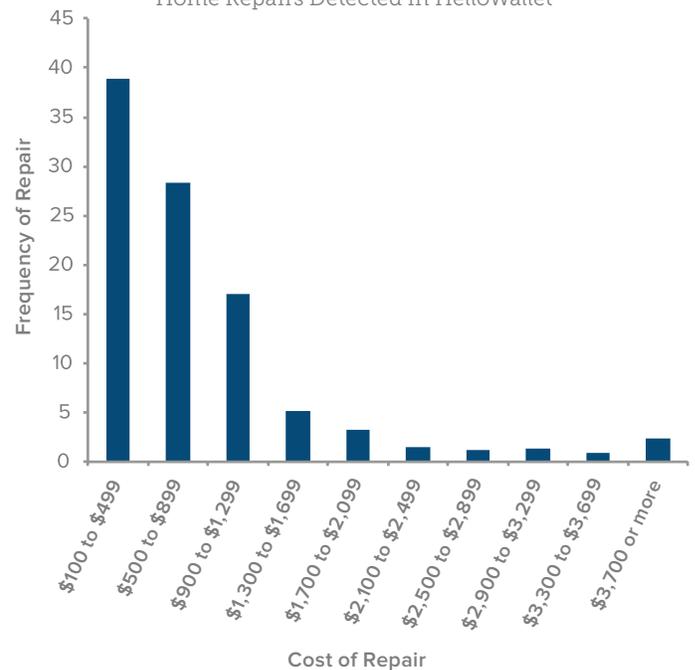
Based on this analysis, we recommend workers save \$750 for car-related emergencies, which is enough to cover 90 percent of the repairs our users incurred

over the last two years. Consistent with our goal of providing a recommendation for a minor emergency, our recommendation will not be enough to cover a more expensive repair, such as replacing a transmission. This recommendation is also greater than the typical car insurance deductible of \$500 in case of an accident rather than a repair, so our recommendation will also be sufficient to cover an advisee’s cost, should he or she get into a minor car accident.

Minor Home Repair Emergencies

Unexpected home expenses can include a broad array of items, including costs associated with plumbers, electricians, HVAC repairs, roofers, and appliances. As with car repairs, to assess an appropriate amount for workers to save if they own a home, we plotted all of the observed home-related expenses in our database to examine the frequency of different costs of home repair. The set of home repairs has even more skewness than emergency car expenses, as shown in Figure 2, with a median of \$275 but a mean of \$757 among the 2,475 repairs we categorized. As with car repairs, these data seem broadly consistent with estimates of home costs from websites that estimate these repairs,

Figure 2: Cost and Frequency of Home Repairs Detected in HelloWallet



Note: We do not include expenses below \$100, because we assume they are routine maintenance, such as HVAC filters.

although there is a good deal of variation across regions we are unable to address.⁹

Based on these data, we recommend that homeowners should have at least an additional \$1,800 on hand if they own a single-family home and \$1,550 if they own a condominium. (We excluded roof repairs in deriving our condominium recommendation.) Consistent with our goal of providing a recommendation for a minor emergency, our recommendation will *not* be enough to cover more expensive repair, such as fully replacing a roof. This recommendation is also greater than the typical home insurance deductible of \$500.¹⁰ But, these recommendations will cover approximately 90 percent of the home-related minor expenses we observed in our data.

We then assessed whether recommendations for proactively saving for an unexpected housing expense should vary by household income. It could be, for instance, that higher-income households own more expensive appliances, which cost more to repair or replace unexpectedly. On the other hand, these more expensive appliances may fail less often than less expensive appliances, making it less likely higher income households will incur emergency expenses tied to appliances. In some cases, we might want to adjust the recommended amount of emergency savings for home repairs based on income. We constructed a regression model that to assess the relationship between income and an unexpected housing expenses. Similar to the model that forecasts unexpected auto expenses, we found that income was a weak, although statistically significant, predictor of these costs. In particular, home repair costs increased by just \$2 for every \$1,000 increase in household income.¹¹

Minor Health Emergencies

Minor health emergencies can include routine unexpected costs, such as a broken bone. However, the category should not include ongoing treatment for chronic conditions, such as insulin for a diabetic, since these costs are known in advance and we believe our members should budget for them. Although we examined our user's healthcare spending data, it is difficult

to tell what health spending was reimbursed by an insurer, which makes the data unreliable.¹² Further, health expenses vary much more widely between providers than other types of expenses, as has been well documented.¹³ For these reasons, we used healthcare deductible amounts as a proxy for minor healthcare costs. As with other recommendations in the minor emergency category, this amount is intended to be a minimum amount, and we also have a major emergency health savings recommendation in the next section.

Although the healthcare deductible amount is personalized for every member based on their healthcare plan, the average in our data is about \$1,000 a year. Of course, this amount will depend on the plan and whether coverage is single or family. For users who do not know their deductible, we recommend \$1,300 and \$2,600 as defaults for single and family coverage respectively, because these are the minimum amounts to qualify as a high-deductible plan. These plans carry larger deductible costs than traditional plans. Since fewer than 20 percent of health participants have high-deductible health plans, these recommendations will be sufficient for most healthcare participants. Additionally, we believe participants with high-deductible health plans are more likely to know their deductibles, as they likely would have made an active choice to join such a plan, or they work for an employer that exclusively offers high-deductible health plans. In either case, there is a strong incentive to understand the basic details of the plan.

Major Emergencies

Our major emergency recommendation is based on workers having enough to safely cover *one* of the following in a given year: a major car repair, a major home repair, or the total out-of-pocket costs for a major health emergency. Our data on major car repair, home repair, checking account withdrawals or credit card charges reveal that major emergencies are much less frequent than minor ones, as shown in Figures 1 and 2 in the previous section. Indeed, there are very few high-cost car or home repairs, so we do not expect these kinds of expenses to be as routine as lower-cost expenses.

Table 2: Example of Major Emergency Recommendation Calculation

Type of Emergency	Individual Who doesn't Own Home or Car	Individual With Car	Family With Car and Home and Generous Health Coverage
Car	\$0	\$3,800	\$3,800
Home	\$0	\$0	\$10,000
Health	\$2,500	\$2,500	\$5,000
Recommended Amount	\$2,500	\$3,800	\$10,000

Note: For the purposes of this example, we assume that the family or individual have unusually generous health benefits to illustrate the methodology.

A summary of the major emergency savings recommendation is determined as shown in Table 2, based on our analysis below. One important premise of these recommendations is that cash (in any liquid account) is fungible and can be used for any of these major emergencies. But, this assumption is not valid for users who have emergency savings in a Health Savings Account (HSA) or Flexible Spending Account (FSA). Later, we discuss the added complications that people face in planning for emergencies while using these special tax-privileged accounts.

Major Car Emergencies

Major unexpected car expenses would generally include major engine or transmission work. As discussed earlier, we found that car repair transactions exhibit a good deal of skewness, with half of repairs costing less than \$225 and an average cost of \$360 as shown in Figure 1, while a few repairs are over \$2,000. Because we have few observations of worst-case car repair scenarios, we rely more heavily on other sources. According to online sources of car repair advice, the most expensive car repairs a typical owner might face would be about \$3,800.¹⁴

Based on this worst-case scenario, we recommend users with a car hold \$3,800 in savings to cope with a major car emergency. However, it is worth noting that we expect most advisees to have out-of-pocket maximum health costs that will exceed this amount, so we don't necessarily expect car repair to be the largest emergency most of our users could face. Nonetheless, this estimate might be important for calculating

benefits for users with generous health coverage who own a car.

Major Home Repair Emergencies

Major unexpected home expenses can include the same broad array of items as minor home emergencies, except for appliance repair, which rarely exceeds minor emergency thresholds. As discussed, the set of home repairs has even more skewness than emergency car expenses, as shown in Figure 2, with a median of \$275 but a mean of \$757 among the 2,475 repairs we categorized. To assess the possibility of a worst-case home repair, we looked at the 99th percentile cost of home repairs in the data. We also looked at data that included roofing repairs and that excluded roofing repairs, to better customize our advice to condominium owners, who are generally not directly responsible for roof repairs.

Based on this analysis, we recommend users who own single-family homes hold \$10,000 for emergencies and users who own condominiums hold \$6,015. Again, using online sources, we believe these estimates are appropriate for most homeowners, given the costs of HVAC replacements and roof replacements. Nonetheless, there are some limitations to these estimates. Specifically, the home repair estimate may well be too high for condominium owners who are not responsible for their HVAC system or plumbing, and these homeowners may wish to adjust their recommendations. (At present, we do not know who owns a condo or not, so we have to simply assume all repairs could be for either a condo or a home, except for roofing repairs.)

Additionally, families that own large homes would need to budget more money for things like roof repairs or mechanical system failures.

Major Health Emergencies

We define major healthcare emergencies as any event that results in an advisee needing to pay their out-of-pocket maximum to address a health issue. Unlike a deductible, which is a floor below which a patient will be responsible for his healthcare costs, the out-of-pocket maximum is the ceiling. For example, if a user needed in-patient surgery, a typical medical plan might cover up to 80 percent of the costs, leaving the user responsible for 20 percent of the costs, until reaching the out-of-pocket maximum.

Ideally, users will know the out-of-pocket maximum in their plans, but we can default to the out-of-pocket maximums specified in the Affordable Care Act (ACA) if they do not. Those maximums are \$6,600 and \$13,200 respectively, which should fully cover any healthcare crisis. These maximums apply to most healthcare plans, and we would expect them to be the maximum most of our advisees would face.¹⁵ Healthcare costs are a major area of focus because the literature shows such costs are one of the leading causes of bankruptcy. For example, Himmelstein et al (2007) find that more than half of American families filing for bankruptcy cited medical causes. Domowitz and Sartain (1999) similarly find that health costs are a strong determinant of bankruptcy.¹⁶ Even though these studies were conducted in 2007, before the ACA went into effect, they find that less than a quarter of bankruptcy filers were uninsured, so the increase in insurance coverage is unlikely to help most people avoid medical bankruptcy.

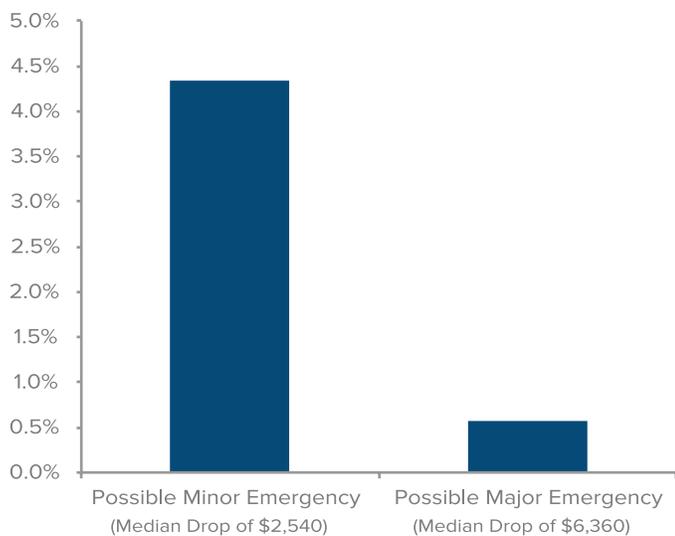
Robustness Checks

To validate our minor and major emergency recommendations, we looked at the existing academic literature. With regard to minor emergencies, our recommendations closely aligned with the \$2,000 academics suggest as a minimum amount required for emergencies; however, this amount is dependent

upon the specifics of a worker's risks. For example Lusardi, Schneider, and Tufano (2011) indicate that \$2,000 should cover the "cost of an unanticipated major car repair, a large copayment on a medical expense, legal expenses, or a home repair." Using survey data, Brobeck's (2008) findings are similar, indicating \$2,000 is the approximate cost of unanticipated emergencies. For users with a car and high-deductible health plan who do not own a home, our methodology will recommend approximately \$2,000 for minor emergencies. But, our recommendation can increase considerably for families owning a home multiple cars, or with very high healthcare deductibles. Variations like the aforementioned are based upon individual circumstances and necessitate personalized advice for minimum level of emergency savings.

In addition to the literature, we employed an anomaly-detection algorithm¹⁷ to ensure frequent account balance drops are not in excess of our likely minor or major emergency savings recommendations. If we observed such drops regularly, it might indicate we underestimated our members' minor emergency savings needs. As shown in Figure 3, the median user's account experiences an unusual account balance (i.e., anomaly) of about \$2,540, which represents a possible minor emergency expense.¹⁸ On average, we see unusual balance drops in about 4.3% of observations. Of course, these balance drops do not necessarily indicate that the member suffered an emergency expense. Some of these balance drops represent spending on discretionary purchases that were planned, budgeted, and possibly expected. Nonetheless, because this median drop is consistent with our emergency saving recommendation, we believe it provides further support for our recommendations. When more extreme anomalies were detected (perhaps indicative of major emergencies), we found the median user experienced a possible major emergency less than once per year, and an associated account balance drop of about \$6,360. We also used a seasonally adjusted model to validate our minor emergency recommendations, and found that our recommendations were consistent with the magnitude of anomalous account balance drops.¹⁹

Figure 3: Size of Anomalous Drops in Savings Balances Among HelloWallet Members and Percent of Months Observed



Source: HelloWallet user data, based on anomaly detection. The size of the anomaly is specified by the deviation of the lower control limit from data that has the median (not mean) removed.

As a percent of income, these minor emergency recommendations are fairly small for well-off families and quite a bit larger for poorer resource-constrained families. Nonetheless, expenses for car repairs or (relatively) small health expenses are unlikely to vary enormously by income. As previously discussed, we did not see a strong relationship between incomes and the costs of minor emergencies.

Job Loss

Job loss, which can sometimes last for long periods of time, is a large risk for American families. Specifically, the Job Openings and Labor Turnover Rate survey finds that between 1.1 and 1.3 percent of the workforce has been laid off each month in recent years, which means the probability of an individual losing his or her job in a given year could be higher than 10 percent. Of course, this level of turnover has been much higher in recent years, particularly during the 2008 economic downturn.

The probability of long-term unemployment is very high, as durations of unemployment have routinely exceeded six months in recent years, according to two data sources. First, using the Bureau of Labor Statistics'

Current Population Survey, more than 10 percent of the unemployed need more than a year to find a new job. (This reflects the poor economic climate over the past few years; during better economic periods, 90 percent of workers who found jobs were unemployed for less than six months rather than a full year.) The Current Population Survey, which is a pooled cross-sectional analysis, is typically used to measure a snapshot of the labor market, but the survey design means it often surveys the same person twice, which allows the Bureau of Labor Statistics to produce the estimates above. Another data source, the Survey of Income and Program Participation (SIPP) is a longitudinal dataset produced by the U.S. Census. Using the most recent SIPP panel, Rothstein and Valletta similarly find that slightly more than 10 percent of those who lost their jobs needed more than one year to find new employment.

Putting it all together, we think to protect against job loss, a worker should save enough to cope with a year of unemployment. Further, having the resources to wait for the right job can be helpful, as it should allow him or her to wait for the "right" job at a good salary. However, it is not possible to self-insure against the possibility of being one of the unlucky members of the labor force that faces extended periods of unemployment beyond a year. Those who find themselves long-term unemployed face declining prospects for reemployment the longer they remain unemployed.²⁰ Generally, such people will need to retrain or at least pick a new career, and many may drop out of the labor force. Such a situation demands more than simply keeping additional resources on hand.

For job loss, we target replacing regular expenses—fixed and variable—for 12 months. Applying the 12-months standard to single workers means they are covered for job loss if they have 12 months of expenses available, minus unemployment insurance (discussed later). However, two-earner families only need to be able to cover the higher-income earner losing his or her job, since it is unlikely both members of a couple would lose their jobs at once. This means that a couple is covered for a job loss if they have 12 months of expenses (fixed and variable) in savings minus 12 months worth of take-home income for the lower-earner. (Of

course, if the lower-earner loses his or her job, the family will have more money than they need since they prepared for the eventuality of the higher-income earner losing his or her job.)

In terms of unemployment insurance, the national average is about 50 percent of income, but it varies widely by state and is always capped so that the replacement rate declines as income increases. Further, the number of weeks a person can collect unemployment also varies between states, although it is usually 26 weeks. Additionally, eligibility for unemployment varies by state, and many unemployed people are ineligible for unemployment benefits. Nonetheless, unemployment insurance is a tremendously important cushion for millions of American workers, and we intend to incorporate an estimate of likely unemployment benefits for our users for each state.

Table 3: Steps to Calculate Emergency Recommendations and Example

Consideration	Calculation	Total for Prototypical Couple
Replace Expenses for One Year	Expenses x 12	\$48,000
Reduce by:		
Second Income	— Income x 12	— \$18,000
Unemployment Insurance	— benefit x 26	— \$7,800
Recommended Total		\$22,200

For example, if Bob and Betty have monthly expenses of \$4,000 and take-home incomes of \$1,500 and \$3,000 respectively, they would need \$22,000 in emergency savings to protect themselves from Betty losing her job for 12 months. In total, they would need \$48,000 to cover their expenses, and Bob could be expected to bring in \$18,000 in income to cover these expenses from his job, while Betty’s unemployment insurance would provide another \$7,800. (For this example, we assume Betty’s unemployment is capped at \$300 per week and lasts for 6 months.) Although Bob and Betty’s tax rates would go down after Betty lost her job, it would be too difficult to incorporate this kind of calculation into an advice product. Table 3 summarizes the calculation for a recommended level of job loss protection for this couple.

Sources of Money to Cope with Emergencies

Our emergency recommendations are designed to help users understand how much they might need to cope with shocks, but this money can come from different sources. Sophisticated users might use complicated strategies, such as assuming that the cost-basis in their Roth IRA accounts can be used for emergencies (while any earnings would not be available.) Other users might assume they can rely on friends and relatives to provide a certain amount of support in case of an emergency. In general, however, most people will protect themselves from emergencies with money in their savings accounts.

With regard to health emergencies, HSAs (and to a lesser degree, FSAs) increase the complexity of planning for emergencies. Money in these accounts can cover health costs, but may not be available for other types of emergencies because of in the Internal Revenue Code. Our recommendation to users is to assume that they should be able to cover their non-health emergencies in cash, but they can cover their health emergencies with cash or HSA balances. The reason for this approach is that the major emergency recommendation is designed to cover health emergencies *and* other types of emergencies, but HSAs and FSAs can only be used for health expenses. Therefore, workers should have money in other accounts to cope with emergencies in addition to HSA accounts. This approach will most affect the recommendations we give to homeowners with large HSA balances, since they will need to have a good deal of additional money to cover home repair expenses not eligible for HSA money.

Conclusions and Future Work

Emergency savings are tremendously important for workers, but there is a lack of good guidance on how to think about emergency savings or balance building them with other goals. Our aim in this paper is to outline a new framework, summarized in Table 4, to assess the costs of different shocks American workers face. We believe that most of the advice on emergency

Table 4: Types of Emergency Recommendations and How We Calculate Them

Type of Emergency	
Minor Emergency	Minor Car Repair + Minor Home Repair + Healthcare Deductible
Major Emergency	Maximum of: Major Car Repair; Major Home Repair; Out-of-pocket Healthcare Costs
Job Loss	1 Year of Expenses - Secondary Income for Year - Unemployment Benefits

Note: For the purposes of this example, we assume that the family or individual has a high-deductible health plan with the minimum deductible to qualify as such.

savings is destined to fail, as most workers know they should place more in emergency savings, but seemingly aren't able to build these savings. We believe our approach represents a realistic, simple approach that will help most workers assess their needs. We will be testing this methodology over the next year to see the results, and we will make modifications based on what we learn. We will also continue to study further customization, based on gender, income, wealth, and education to see if our recommendations should vary based on these factors.

End Notes

¹See for example Fellowes, Matt, and Katy Willemin. “The Retirement Breach in Defined Contribution Plans: Size, Causes, and Solutions.” *Washington, DC: HelloWallet*. Web-site: <http://www.hellowallet.com> (2013).

²Himmelstein, David U., Deborah Thorne, Elizabeth Warren, and Steffie Woolhandler. “Medical bankruptcy in the United States, 2007: results of a national study.” *The American Journal of Medicine* 122, no. 8 (2009): 741-746.

³Brobeck, Stephen. “Understanding the emergency savings needs of low- and moderate-income households: A survey-based analysis of impacts, causes, and remedies.” *Washington, DC: Consumer Federation of America* (2008).

⁴For example, Brobeck (2008) employs a survey methodology to ascertain what low- and moderate- income workers believe that they need for retirement. This approach does not attempt to disaggregate the risks faced by different households. Similarly the approach taken by Lusardi, Schneider, and Tufano (2011) is to assume that \$2,000 is minimum amount for emergencies. This approach provides a good aggregate measure of financial fragility, but it does not seek to disaggregate between workers with high-deductible health plans, or cars, or who own homes, all of which could increase their emergency-savings needs.

⁵Lusardi, Annamaria, Daniel J. Schneider, and Peter Tufano. *Financially fragile households: Evidence and implications*. No. w17072. National Bureau of Economic Research, 2011.

⁶We parsed strings for key car-repair words such as garage, auto, and repair while excluding transactions for car financing or recurring transactions that were more likely for other kinds of services.

⁷We looked at the range of common repairs from repairpal.com and edmunds.com.

⁸We constructed the correlation coefficient and an OLS and logistic regression to examine this association. Specifically, we used repair costs as the regressand and age and income as regressors. To validate the small association, we also use the natural log of income as a regressor.

⁹Specifically, we looked at estimates on home repairs from homewyse.com and homeadvisor.com.

¹⁰This is the default deductible for quotes from several major insurance websites.

¹¹As with car repairs, we constructed the correlation coefficient and an OLS and logistic regression to examine this association. Specifically, we used repair costs as the regressand and age and income as regressors. To validate the small association, we also use the natural log of income as a regressor.

¹²For example, we might see a transaction for a large health expense that was ultimately reimbursed by an insurer, and thus would not have been absorbed by the user. However, we cannot necessarily detect what was reimbursed or if an expense was reimbursed.

¹³Just for example, see The Health Report of America. 2015. *A Study of Cost Variations for Knee and Hip Replacement Surgeries in the U.S.* Blue Cross Blue Shield.

¹⁴We looked at the range of common repairs from repairpal.com and edmunds.com.

¹⁵Some healthcare plans that existed before the ACA went into effect are “grandfathered” into having higher out-of-pocket maximums.

¹⁶Domowitz, Ian, and Robert L. Sartin, 1999, Determinants of the Consumer Bankruptcy Decision, *Journal of Finance*, 54-1, 403–20.

¹⁷We compared two different algorithms, each with results consistent with our calculated recommendations. The first uses lower control limits and the second adjusts for seasonality and uses the extreme studentized deviation test.

¹⁸With this algorithm, we search for drops in balances that are more than 1.5 standard deviations greater than average change in the balance, but less than 3 standard deviations. We also search for drops more than 3 standard deviations greater than the average change in balance.

¹⁹As a further robustness check, we investigated whether a seasonal adjustment would make a large difference in users’ balance drops. Using a seasonal hybrid algorithm, we found balance drops typically ranged from \$400 to about \$4,000, which again is consistent with the range of our recommendations.

²⁰Krueger, Alan B., Judd Cramer, and David Cho. “Are the long-term unemployed on the margins of the labor market?” *Brookings Papers on Economic Activity* (2014): 229-280.

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The author would like to thank Matt Fellowes, Amber Jaycocks, Lee Eliav, Robert Lakatos, and numerous academic and expert reviewers who provided invaluable feedback on earlier drafts of this paper.



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