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# Technical Appendix: Repair Cost Estimates (Revised for 2025 Update)

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## Introduction

This appendix outlines the methodology for calculating the repair cost estimates<sup>1</sup> presented in the research brief [Home Repair Costs 2025: Updated Estimates and New Measures of Cooling Needs](#). The following paragraphs are adapted from the Technical Appendix to the 2019 report to reflect improvements and additions to the cost estimation methodology. The original methodology was developed collaboratively by the Federal Reserve Bank of Philadelphia and PolicyMap,<sup>2</sup> with subsequent updates by Federal Reserve staff. An accompanying [Technical Appendix Table](#) provides additional details and highlights changes incorporated since the 2019 analysis.

## Data Sources

Like previous iterations, the repair need estimates presented in the 2025 analysis draw from two data sources: (1) the American Housing Survey (AHS) Public Use File (PUF), which provides detailed information on housing problems experienced by respondents, and (2) a custom RSMeans data set developed in collaboration with consultants at Gordian, which provides estimates of the average costs of repairs for each type of housing problem reported in the AHS.

### American Housing Survey

The AHS, administered by the Census Bureau with the support of the Department of Housing and Urban Development, has been an invaluable source of information on the housing stock in the United States since its inception in 1973. In its current form, the survey is conducted every other year through personal interviews either of the householder, or in the case of vacant units, a landlord or other person with detailed knowledge of the property. Data collected by the AHS is published in the National and Metropolitan PUFs, which contain anonymized respondent

<sup>1</sup> The 2019 version of this appendix refers to this as the “cost-based index of repair needs.” The term “repair cost estimates” is substituted here for clarity and to reflect the presentation of these figures in more recent publications.

<sup>2</sup> The technical appendix for the 2019 report is available at [www.philadelphiafed.org/community-development/housing-and-neighborhoods/measuring-and-understanding-home-repair-costs](http://www.philadelphiafed.org/community-development/housing-and-neighborhoods/measuring-and-understanding-home-repair-costs).

microdata that can be used to produce custom tabulations.<sup>3</sup> The AHS is designed as a longitudinal survey, enabling researchers to follow the same units over time. The AHS includes information on a range of housing-related topics, including housing characteristics, housing costs, home improvements, demographics of householders, reasons for recent moves, and housing problems. It is currently the only publicly available, nationally representative source of data with highly detailed information on these characteristics of housing units.

The cost estimation methodology described in this document was developed based on the 2015 AHS and applied, with some adjustments over time, to the subsequent 2017, 2021, and 2023 AHS PUFs. The microdata codebook is largely identical for the variables included in each iteration of the analysis, with the important exception of the “Cooling Problems” variables first added to the 2023 survey.<sup>4</sup> This analysis considers only occupied housing units where interviews were conducted. Out of 55,669 housing units surveyed in 2023, 48,527 were occupied housing units<sup>5</sup> where an interview was conducted (INTSTATUS = 1); 928 were interviewed but have their usual residence elsewhere, and 6,214 were vacant housing units.<sup>6</sup>

### **Custom RSMeans Database from Gordian**

The author worked with Gordian, a company that provides residential and facilities maintenance, construction, and repair cost data for real estate professionals, to assign specific repairs to each housing problem identified in the AHS and to estimate the costs of reasonable repairs using its RSMeans database.<sup>7</sup> For the 2025 update, the majority of these estimates were based on the RSMeans 2024 Contractor’s Pricing Guide database of Residential Repair & Remodeling Costs. A subset of repairs was not available in the Contractor’s Pricing Guide data. These largely pertained to major structural and plumbing repairs and were omitted either because the scale or type of repair required the use of a contractor accustomed to working on larger commercial projects, or because RSMeans could not produce reliable estimates for smaller contractors. For these, RSMeans substituted estimates from the 2024 Facilities Maintenance & Repair Cost database. Estimates based on the Facilities Maintenance & Repair Cost database assume the use of open shop labor, which is associated with lower hourly wages than union labor but still higher than the wage rates used in the Contractor’s Pricing Guide estimates. Both sources of estimates reflect national average costs inclusive of materials, labor, contractor overhead, and contractor profit. For estimates at the metropolitan statistical area (MSA) level, dollar values are adjusted using regional multipliers derived from the RSMeans database (see the National, Regional, and Metropolitan Estimates section for details).

<sup>3</sup> For additional details, see *Getting Started with the PUF: 2015 and Beyond*, available at [www.census.gov/programs-surveys/ahs/tech-documentation/help-guides/puf\\_start.html](http://www.census.gov/programs-surveys/ahs/tech-documentation/help-guides/puf_start.html).

<sup>4</sup> For more information on changes to AHS survey module over time, consult the technical documentation available at [www.census.gov/programs-surveys/ahs/tech-documentation/def-errors-changes.html](http://www.census.gov/programs-surveys/ahs/tech-documentation/def-errors-changes.html).

<sup>5</sup> Of these, 25 records were dropped from the analysis because the reported unit type was “Boat, RV, van, etc.”

<sup>6</sup> For vacant units, a limited version of the AHS interview (which omits many questions from the Housing Problems module) is conducted with a landlord, property owner, real estate agent, or a knowledgeable neighbor.

<sup>7</sup> For more information on the RSMeans database, see [www.rsmeans.com/](http://www.rsmeans.com/).

## Methodology

The following sections provide a detailed description of the process of developing and validating the repair cost estimates. Initially, the original research team worked with experts from Gordian to develop a custom data set matching specific repair needs identified in the AHS with the estimated costs of a typical repair. For the 2025 update, updated versions of these original cost estimates plus additional repair interventions related to the maintenance and installation of air conditioning equipment were obtained from Gordian.

Once costs for specific repairs were established, this custom RSMeans data set was integrated with the AHS PUF to estimate the cost of repairs for each occupied housing unit in the survey. In most cases, this involved simple crosswalking to map one or more variables to the established repair cost estimate, sometimes scaled to the size of the unit or to an estimate of the area in need of repair. In some housing units, however, one repair might obviate the need for another repair. In these instances, a hierarchy of repairs was established to avoid redundancies. Finally, using survey weights provided in the AHS, unit-level repair estimates were aggregated to produce national-, regional-, and MSA-level estimates of repair costs according to various household and housing unit characteristics.

### Identifying Housing Deficiencies in the AHS

The first step in defining unit-level repair needs entailed reviewing the technical documentation for the AHS to identify variables associated with physical deficiencies in the unit. Variables were primarily drawn from the “Housing Problems” module. Of the 70 variables in this module, 47 variables were determined to be suitable for this analysis; the other 23 were excluded because they represented more generalized versions of related variables or were not considered to be directly related to structural deficiencies.<sup>8</sup> Additionally, although not listed under the “Housing Problems” module, the variable HOTWATER (type of hot water system) was added to this list, since the lack of hot running water has historically been considered a housing quality concern. The variable HEATTYPE (type of main heating equipment) was also included to identify units that did not have heating equipment among those that reported being uncomfortably cold during the prior winter. Similarly, ACPRIMARY (type of primary air conditioning) was used to identify units without air conditioning equipment among those reporting being uncomfortably hot during the prior year.

Additional AHS variables provided useful context to further specify the types of repairs that would be needed in each surveyed housing unit. For example, if a unit needed a heating or cooling equipment repair, the type of HVAC system in that unit would have a major influence on the cost of the repair. The cost of repairing cracks, holes, or leaks in the foundation depend on the kind of foundation as well. Repairing the wall of a full basement is more expensive than repairing a concrete slab. Similarly, problems with plumbing require different corrective measures depending on whether the unit is on sewer or septic and whether it has municipal or well water. Housing units served by a public water supply that have frequent breakdowns in water service may need to have a water main replaced. In contrast, houses on well water may

<sup>8</sup> For the 2025 update, the previously omitted COLDCOST variable (being uncomfortably cold due to heating costs) was included in this list since physical deficiencies are a common contributor to excessive heating costs.

need a very costly well pump replacement. Whether a household incurs the costs of addressing sewer breakdowns may also depend on whether the unit is on a public sewer system or is responsible for maintaining its own septic system.

With the inclusion of all relevant context variables, a total of 110 repair scenarios were specified for the analysis. As described in the “Affected Area or Scaling” column of the Technical Appendix Table, several repair scenarios involving heating and cooling equipment were adjusted for the size and type of the unit or the number of residents.

### **Assigning Repairs to Housing Problems**

For several equipment-related repairs, the frequency or severity of the problem over a specified period of time was used to establish which repair would be most appropriate. If a system broke down one or two times over the specified period, the assigned intervention was repair or servicing. For three or more reported breakdowns, the assigned intervention was replacement.

For example, in cases where a toilet reportedly broke down once or twice over the previous three months (NOTOILFREQ), it may need a low-cost repair, but if it failed more regularly, the whole toilet may need to be replaced. Similarly, if a house is on a septic system that broke down once or twice over the previous three months (SEWBREAK), a relatively inexpensive unclogging procedure may solve the problem. If it broke down more frequently, a much more expensive replacement of the septic system may be required. When a house on well water had one or two interruptions in water service over the previous three months (NOWATFREQ), the well piping may need to be replaced. When more interruptions occur, a much more expensive well pump replacement may be needed. A unit reporting one or two heating or cooling equipment breakdowns over the previous year (COLDEQFREQ and HOTEQFREQ, respectively) may need to have its equipment serviced, whereas a greater number of breakdowns may indicate a need for equipment replacement.

Occasionally, repairing a system can be more expensive than simply replacing it. Those cases default to the more comprehensive, cheaper cost of replacement. For example, when a housing unit connected to a public water system is without running water once or twice in a three-month period (NOWATFREQ = 1 or 2, WATSOURCE = 1 or 3), a repair to the water main may be needed. However, estimates from the RSMMeans database suggested that repairing a water main in this context may be costlier than replacing one. Accordingly, a rational property owner would choose the less costly option of replacement.

### **Repair Cost Assumptions**

For certain housing problems identified in the AHS, developing reasonable repair cost estimates required making assumptions about the dimensions of the housing unit. In the AHS PUF, the variable for unit total square footage is provided as a binned categorical variable (UNITSIZE). The midpoint of each size category was used to scale repair costs that were provided on a per square foot basis.<sup>9</sup> For units for which the size variable was missing or not

<sup>9</sup> Five hundred square feet was used for units in the “Less than 500 square feet” category and 4,000 square feet was used for units in the “4,000 square feet or more” category.

reported, 1,500 square feet was imputed based on the overall median unit size reported in the AHS Table Creator.<sup>10</sup>

### **Dimensional Assumptions**

The following list outlines key dimensional assumptions used to adjust repair cost estimates provided by Gordian to housing unit records in the AHS PUF. More detailed descriptions of repair assumptions, including specific tasks and materials as well as standard assumptions built into the RSMMeans estimates, can be found in the Technical Appendix Table.

- For units that reported no electrical wiring (NOWIRE=3), the cost of installing wiring, outlets, and switches was provided on a per square foot basis. Assuming a typical room size of 12 feet by 12 feet, this per square foot cost was multiplied by 144 and by the number of finished rooms in the unit (TOTROOMS minus UFINROOMS).
- For attic-related repairs (COLINSUL or HOTINSUL), the attic footprint was assumed to be the same as the unit footprint (imputed unit size divided by UNITFLOORS), with insulation added to 100 percent of the footprint area. This calculation incorporates a minimum cost to prevent implausibly low estimates.
- In the case of units reporting crumbling foundations (FNDCRUMB), assumptions regarding the affected area of the foundation were provided by Gordian, and calculations were adjusted for each foundation type:
  - Basements (FOUNDTYPE=1|2): Repairs required an estimate of the surface area of interior walls. To calculate this, the basement length and width were estimated as the square root of the unit footprint (imputed unit size divided by UNITFLOORS). This value was halved for partial basements (FOUNDTYPE=2). Basement wall heights were assumed to be eight feet. Repairs apply to 5 percent of the calculated wall area.
  - Crawl Spaces (FOUNDTYPE=3): Repairs required an estimate of the surface area of interior walls. Foundation length and width were calculated using the same method used for basements. Crawl space wall height was assumed to be four feet. Repairs apply to 5 percent of the calculated wall area.
  - Concrete Slab (FOUNDTYPE=4): Repairs apply to 25 percent of the calculated unit footprint.
  - Mobile home on masonry foundation (FOUNDTYPE=5): Repairs required an estimate of the surface area of the foundation. Foundation length and width were calculated using the same method used for basements. Foundation wall height was assumed to be three feet. Repairs apply to 25 percent of the calculated wall area.
  - Mobile home on concrete pad (FOUNDTYPE=6): Repairs apply to 100 percent of the calculated unit footprint.

<sup>10</sup> See [www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s\\_areas=00000&s\\_year=2023&s\\_tablename=TABLE2&s\\_bygroup1=1&s\\_bygroup2=1&s\\_filtergroup1=1&s\\_filtergroup2=1](https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s_areas=00000&s_year=2023&s_tablename=TABLE2&s_bygroup1=1&s_bygroup2=1&s_filtergroup1=1&s_filtergroup2=1) (accessed August 21, 2025).

- Mobile home on blocks (FOUNDTYPE=7): Five blocks would be replaced, irrespective of unit footprint.
- For roof-related repairs (ROOFSAG, ROOFSHIN, ROOFHOLE, and LEAKOROOF), the total roof area was calculated as the unit size divided by the number of stories (UNITFLOORS) multiplied by 1.25, which assumes a roof pitch of nine feet in 12 feet (approximately 37 degrees). For ROOFHOLE and LEAKOROOF, repairs apply to five percent of the calculated roof area. For ROOFSAG and ROOFSHIN, repairs would to 100 percent of the calculated roof area.
- Repairs pertaining to exterior walls (WALLSIDE and WALLSLOPE) required an estimate of the exterior wall surface area of the structure. The length and width of the structure were conservatively calculated as the square root of the unit footprint (imputed unit size divided by UNITFLOORS). The typical height of the first floor was estimated at 10 feet and multiplied by the number of stories (UNITFLOORS). Repairs apply to 5 percent of the calculated wall area.

For replacements of heating and cooling equipment and water heaters, the number of potential options was limited by the range of equipment sizes available in the RSMMeans data set. Accordingly, for heating and cooling equipment replacements, the unit size categories were collapsed into groups depending on the type of system, and those groups were assigned a corresponding equipment size. For respondents in multifamily units with steam or hot water heating systems (HEATTYPE=2), the repair for frequent heating system breakdowns differed from that of single-family or manufactured homes, as these systems are more likely to be centralized in multiunit structures. Instead, for these units, the cost to install baseboard heating equipment in each finished room was applied. For water heater replacement, the number of residents reported in the AHS informed the size of water heater required for each unit. Equipment specifications are detailed in the Technical Appendix Table.

### **Number of Items in Need of Repair**

Several AHS-reported housing problems required assumptions about the number of items in need of repair. For example, the AHS survey asks whether the unit has any windows that are boarded up or broken but does not ask how many. The following list details the assumptions for these types of repairs:

- For units in which one or more rooms lack a working electrical outlet (PLUGS=2), an average of 1.5 outlets would need to be installed.
- For units with baseboard heating that reported more than two heating equipment breakdowns (COLDEQFREQ>2), equipment in half of the finished rooms in the unit, rounding up, needed replacement. For households that reported being uncomfortably cold because of inadequate heating capacity (COLDHTCAP=1) in units with baseboard heating, an average of two baseboard units needed to be added to the unit.
- For units with window-mounted air conditioning units reporting any cooling equipment breakdowns (HOTEQFREQ>0), equipment in half of the finished rooms in the unit, rounding up, needed replacement. For household that reported being uncomfortably hot because of inadequate cooling capacity (HOTCLCAP=1) in units with window air

conditioning, an average of two window air conditioning units needed to be added to the unit.

- For repairs to broken, boarded up, or leaking windows (WINBROKE=1, WINBOARD=1, or LEAKOWALL=1), an average of 1.5 windows need to be repaired or recaulked.

### **Repair Cost Substitutions**

Last, for housing deficiencies that called for similar repair interventions or had missing or uncommon equipment types, the following repair scenarios were used:

- The AHS contains information on six different rooms that could be affected by mold — bathroom (MOLDBATH=1), kitchen (MOLDKTCH=1), bedroom (MOLDBEDRM=1), living room (MOLDLROOM=1), basement (MOLDBASEM=1), and other (MOLDOTHER=1). Assuming that the cost of remediating mold would be similar for each type of room, a standard mold remediation intervention for an affected area of 100 square feet was applied to all room types.
- For heating-related repairs to units with uncommon heat sources (HEATTYPE 6 through 12), installing a baseboard heater in each finished room was the default intervention. Units that reported being uncomfortably cold and did not have heating equipment (HEATTYPE=13) or reported using a cooking stove for heating (HEATTYPE=14) were also assumed to need the installation of an electric baseboard unit in each finished room (TOTROOMS – UFINROOMS). This is assumed to be less costly than installing a new centralized system in a unit where this type of system and its associated vents or plumbing are not already present.
- Units that were reported as being uncomfortably cold due to heating costs (COLDCOST=1) or for some reason other than cost, equipment failure, and inadequate capacity (COLDOTHER=1) were assigned a weatherization intervention. Similarly, units that report being uncomfortably hot due to cooling costs (HOTCOST=1) were assigned the same weatherization repair, as were units that reported being uncomfortably hot due to leaking windows, doors, or walls (HOTLEAK=1) and for unspecified reasons other than equipment failures, inadequate cooling capacity, leaks, and cost (HOTOTHER=1).
- For units that reported being uncomfortably hot and did not have air conditioning equipment (ACPRIMARY=12), the installation of one window air conditioning unit per finished room (TOTROOMS – UFINROOMS) was assigned. As with the baseboard heating units, this is assumed to be the least costly intervention.
- Sewer system–related repairs for standard septic tanks (SEWTYPE=2) were applied to other types of septic tank systems (SEWTYPE 3 through 6).
- Units that experienced disruptions in their water service but did not report the source of their water (WATSOURCE=3) were assigned the same repair cost that was used for those connected to a public water system.
- For single-family units where the foundation type was not reported (FOUNDTYPE=8), the repair for a concrete slab basement was assigned, as this was the least expensive basement repair. Similarly, for manufactured housing where the foundation type was not

specified (FOUNDTYPE=9), the low-cost repair for concrete block foundations was used.

- Boarded-up windows (WINBOARD=1) were assigned the same window replacement cost as broken windows (WINBROKE=1).
- If the respondent reported not knowing the source of an interior leak (LEAKIDK=1), then the repair cost for a leak from an unspecified source (LEAKOOTH=1) was applied.

## Repair Hierarchy

Some housing units have multiple problems that could be solved by a single repair. To avoid overestimating repair costs with redundant repairs, the following decision rules were used to determine which repairs supersede others:

- There are several potentially overlapping repair needs pertaining to roof-related issues (ROOFSAG, ROOFSHIN, ROOFHOLE, and LEAKOROOF). The most intensive repair involves addressing a sagging roof (ROOFSAG=1), which requires costly structural work. As a result, this supersedes all other roof repairs. The next most intensive repair is replacing missing roofing materials (ROOFSHIN=1). This is followed by repairing a hole in the roof (ROOFHOLE=1). Last, if no other roof-related repair needs are indicated, the repair for a roof leak (LEAKOROOF=1) would be applied to the unit.
- For heating problems, replacing equipment associated with frequent breakdowns in the heating equipment (COLDEQFREQ  $\geq 3$ ) supersedes the repairs assigned to inadequate heating capacity (COLDHTCAP=1), which in turn supersedes the repairs associated with less frequent breakdowns (COLDEQFREQ=1|2). Both frequent heating system breakdowns and inadequate heating capacity would require either replacing or upgrading the heating equipment, which would only need to be performed once for housing units reporting both problems. Similarly, one or two breakdowns of an otherwise functional heating system may only require relatively inexpensive maintenance, but this cost would be redundant if the housing unit also reported a problem that would require heating equipment replacement.<sup>11</sup>
- Following similar logic for cooling problems, equipment replacement associated with frequent breakdowns in cooling equipment (HOTEQFREQ $\geq 3$ )<sup>12</sup> supersedes repairs associated with inadequate cooling capacity (HOTCLCAP=1), which in turn supersedes repairs associated with less frequent equipment breakdowns (HOTEQFREQ=1|2). Additionally, for units in which the heating equipment is a heat pump, the same equipment is assumed to be used for air conditioning. Accordingly, heat pump replacements due to reported heating problems (COLDEQFREQ $\geq 3$  or COLDHTCAP=1 and HEATTYPE=03) supersede those associated with frequent cooling equipment breakdowns.

<sup>11</sup> In instances in which equipment replacement was less expensive than repair, the replacement intervention was applied.

<sup>12</sup> For units with window air conditioning equipment, the more intensive replacement intervention was applied regardless of the number of equipment breakdowns.

- For the several heating and cooling problems that were assigned the weatherization repair scenario, addressing heating costs (COLDCOST) superseded addressing unspecified heating issues (COLDOTHER), which in turn superseded heating costs (HOTCOST), cold air leaks (HOTLEAK), and unspecified cooling issues (HOTOTHER), in that order.
- For units that reported being both uncomfortably cold and uncomfortably hot due to inadequate insulation, the intervention for uncomfortably cold units (COLDINSUL) supersedes the intervention for uncomfortably hot units (HOTINSUL).
- For structural repairs, if the exterior walls of a house or building are sloping (WALLSLOPE=1), the structurally deficient portion of those walls would need to be replaced. When exterior walls are reported as sloping and missing materials such as siding or bricks (WALLSIDE=1), the need for a replacement wall supersedes the need for the materials repair. Similarly, for households reporting a leak coming from an unknown outside source (LEAKOOTHER=1) in addition to these exterior wall issues, repairs to the exterior wall are assumed to address the source of the outside leak, superseding the leak repair.
- For leaks from closed doors or windows (LEAKOWALL=1), sealing windows to prevent leaks is superseded by complete window replacement because of broken or boarded-up windows (WINBROKE=1 or WINBOARD=1).
- A leaking water heater (LEAKIWATH=1) is superseded by replacing a broken or missing water heater (HOTWATER=7), since a new water heater would address the leak.
- In units that lack electrical wiring (NOWIRE=3), the repair assumes the installation of four outlets and one switch in every finished room. This would obviate the need to address the lack of an electrical outlet in each room (PLUGS=2).
- Leaks originating from a basement (LEAKOBASE=1) were likely to be addressed if the unit already requires repair to a cracked or crumbling foundation (FNDCRUMB=1). Accordingly, the foundation repair supersedes basement leak repairs.

### **Development of National, Regional, and Metropolitan Estimates**

After estimating the total repair cost for each surveyed unit, the full sample weights (WEIGHT) were used to calculate weighted summary statistics and aggregate repair costs tabulated by a number of demographic, geographic, and housing type variables. The National PUF includes variables that specify the census division<sup>13</sup> and, for units in the 15 largest metro areas, the MSA of each respondent. The separate Metropolitan PUF provided microdata for an additional five MSAs, drawn from a list that rotates each survey year.

All tabulations at the national and census region levels used the weighted national average cost directly from the RSMMeans database. To account for regional variations in construction costs, dollar value MSA estimates were adjusted using location factors for the largest principal city. These location factors were drawn from the *Gordian Contractor's Pricing Guide 2024*:

<sup>13</sup> Census divisions are collections of states and the District of Columbia grouped by proximity. Census divisions form the building blocks of census regions. For more information, see [www2.census.gov/geo/pdfs/maps-data/maps/reference/us\\_regdiv.pdf](http://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf).

*Residential Repair & Remodeling Costs with RSMeans Data*, which provides cost multipliers at the three-digit zip code level for most major cities.<sup>14</sup>

## **Limitations**

As noted previously, a core challenge of translating AHS housing problem variables into repair costs is the lack of contextual information on building materials and the magnitude of reported issues. For example, the survey does not provide information on roofing or exterior wall materials, the size of holes in interior walls or flooring, or the number of windows that are boarded up or broken. In these situations, the analysis used conservative but reasonable assumptions, outlined above and detailed in the Technical Appendix Table.

There are housing deficiencies that may present threats to the safety and well-being of residents that are simply not reported in the standard AHS modules. These include missing or broken stairs and bannisters, which present major injury risks. Furthermore, this analysis does not capture the need for adaptive modifications that may be critical to a resident's ability to safely navigate their unit and perform everyday tasks. Housing deficiencies that are unlikely to be observed in residents' everyday lives, such as lead exposure, water contaminants, and indoor air quality issues, are similarly unavailable in the survey.

Additionally, the cost estimates do not reflect local and regional factors that may influence the cost of repairs. This includes regulatory factors, such as lead removal requirements or environmental performance standards. Additionally, some communities, particularly rural areas, may have few contractors available to perform repair work or limited access to home improvement retailers, which may contribute to higher repair costs. Similarly, residents and property owners in distressed and underserved communities may face greater difficulty hiring qualified contractors to perform the repair work. Some of these variations may be captured in regional cost adjustments applied to MSA-level estimates.

Owing to data constraints, the repair cost estimates likely understate the magnitude of repair needs for the multifamily housing stock. Many of the cost estimates supplied by Gordian assume the repair applies to a single-family home, unless otherwise specified (e.g., certain manufactured housing-specific repairs). For many interventions, repair costs are likely to be comparable in different unit contexts (e.g., repairing a crack in an interior wall), although for others, there may be substantial differences (e.g., repairing a 10th-story window). Furthermore, AHS respondents in multifamily housing are not asked most questions pertaining to structural housing issues (e.g., issues related to roofs, foundations, exterior walls, or building systems). As a result, this analysis does not capture the need for more extensive repairs to larger residential buildings. Similarly, without sufficient information to estimate repair costs for vacant units, these estimates pertain only to occupied housing and thus understate the total magnitude of disrepair in the national housing stock.

Given these limitations, the repair cost estimates should be understood as an approximate measure of the costs to mitigate the substandard conditions reported in the AHS.

<sup>14</sup> These adjustment factors range from a low of 0.85 to a high of 1.31 for this set of principal cities.



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