# **Incomplete Plumbing in Poor Rural Areas**.

by Barry Ryan

Department of Applied Economics,
University of Minnesota, Saint Paul

September 11, 1995

Abstract: Poor rural counties have a disproportionate share of the nation's substandard housing. Within this group of poverty counties the problem of incomplete household plumbing is fairly concentrated, as it is in rural America generally. Minorities, the elderly, and renters are at a higher risk of living with incomplete plumbing, while the largest numbers of plumbing deficient households are whites, young families, and homeowners. Despite the remaining problems, access to water and sewer services has increased significantly in poor rural areas. Eliminating substandard rural housing will require continued improvements in household sewage disposal.

Contents



Keywords; incomplete plumbing, infrastructure, rural poverty

Barry Ryan is a research fellow in the Department of Applied Economics, University of Minnesota, Saint Paul. This research was funded in part by a grant from the Rural Utility Services Administration, U.S.D.A, with special thanks to the Economic Research Service, U.S.D.A.

## **Introduction**.

There is a shared value in America that all its citizens have the fundamental right to a clean water environment. Over the last 30 years, water quality standards have become more demanding, and billions of dollars have been spent building and upgrading our infrastructure. We have made tremendous progress, and today the vast majority of Americans take water and sewer services for granted. Yet close to a million homes are still without running water or a flush toilet. These families are often among the nation's poorest, and substandard plumbing is only one reflection of their impoverished lives.

Beyond the humanitarian reason, government has a responsibility for the larger public health and safety, to improve the sanitary conditions in these households. Yet to effectively target their financial resources, policymakers need more information. This report describes the extent of inadequate plumbing in rural America, and in particular the conditions in persistent poverty counties. Comparing rural poor counties with the rest of rural and urban America, illustrates how unevenly substandard housing is distributed. This study uses 1990 Census of Population and Housing data to examine the status of incomplete plumbing for the total housing stock, and then in more detail, the household characteristics of occupied substandard housing. The last section of this report describes water and sewer system access for the total housing stock.

## **Background**.

Even before the environmental legislation of the 1970's, the federal government recognized the inadequacy of rural America's water and sewage infrastructure. New laws were passed to make it easier for small communities to get financial assistance for water and sewer projects from federal agencies, such as the Farmers Home Administration. Rural housing conditions were documented by the Economic Research Service (ERS) in a series of research reports beginning in the early 1960's. These studies found virtually all urban housing had complete plumbing facilities in 1960, while 20-percent of rural homes were without indoor water, and 30-percent had no flush toilet. The worst conditions were in

the East South Central census region (Tennessee, Kentucky, Mississippi, and Alabama) where 45-percent of rural homes had no indoor water and 57-percent had no flush toilet.

The ERS analysis used housing data from the 1960 Census of Population and Housing, which provided far greater detail on housing conditions than is available today. Reflecting the plumbing standards of a different time, household facilities were classified as either inside or outside the home, and for shared or exclusive use. Conditions differed enough to warrant distinctions between hot and cold running water, cold water alone, or no piped water at all. In contrast, the 1990 Census has a singular definition of a housing unit with complete plumbing; it must have hot and cold piped water, a flush toilet, and a bathtub or shower. All three elements are required for a unit to be counted, but they need not be for the exclusive use of the resident household.

Between 1960 and 1990 the U.S. population grew by 38 percent, to 249 million persons. The U.S. housing stock, however, nearly doubled -- from 53 million units to more than 102 million units. The 1960 rural population was estimated at 57 million persons, using the standard Census definition for rural (any community with 2,500 persons or less, plus people living in the open country). There were 17.6 million rural housing units, of which 3.5 million units had no running water, and 5.4 million lacked flush toilets. This study uses a somewhat different definition of rural, developed by ERS for policy research, and based on county government boundaries (2,276 rural, 813 metropolitan). Using this definition, the 1990 rural population was 51 million persons, and the rural housing stock numbered 22.5 million units.

The Economic Research Service organizes rural counties further into 11 groups, based on their primary economic activity, or dominate social characteristic. Rural counties need not fall exclusively into one of these 11 groups, indeed many overlap. For instance, the 535 persistent poverty counties overlap heavily with farming, manufacturing, transfers-dependent, and nonspecialized categories in the ERS typology. To qualify as a persistent poverty county, 20 percent or more of the households living in the county had to have incomes below the national poverty line in each of the last four census surveys; 1960-1990. Rural poor counties are characterized by Cook and Mizer as having a disproportionate

share of at-risk populations; minorities, female-headed households, high school drop-outs, and persons with physical or mental disabilities. Incomes are lower and unemployment is higher in persistent poverty counties, than in the rest of rural America.

**Housing units**.

One percent of the U.S. housing stock is plumbing deficient, about 1.1 million units. Despite having only 22 percent of the nation's total housing stock, rural America has over half the incomplete plumbing units. Poor rural counties, which hold just 4 percent of the U.S. housing stock, claim 17 percent of the substandard units. Overall, 5 percent of poor rural housing has incomplete plumbing, twice the rate of non-poor rural areas, and ten times higher than metropolitan counties.

Table 1. Plumbing Status of U.S. Housing -- 1000's Units

| | Complete | Incomplete |
|---|---|---|
| Metropolitan | 79,343 | 515 |
| R. Non-poor | 18,058 | 393 |
| Rural Poor | 3,761 | 193 |
| U.S. Total | 101,16 | 1,101 |

Source: 1990 Census of Population and Housing.

Many factors may contribute to these inequalities in housing. Poor rural households have lower incomes, and thus may not be willing or able to pay for better plumbing services. Economies of scale may also work against poor rural counties, which are less densely populated than non-poor counties, despite having larger households. Settlement patterns and the local geology may also play a role. The surface water resources of rural poor counties are only half that of non-poor counties. The relative scarcity of water may increase resource management problems, and have a negative impact on the viability of

water and sewer services. Largely concentrated in the southern U.S., poor rural counties may also reflect other geographic and socioeconomic peculiarities of that region.

**Housing types**.

Single family homes (SFH), including attached units such as row houses, make up two-thirds of the U.S. housing stock. A similar portion of the plumbing deficient housing is single family as well. In poor rural areas, 71 percent of the housing stock is SFH, a smaller share than in non-poor rural areas. Yet among the plumbing deficient rural poor units, 78 percent are SFH.

---

Table 2. Incomplete Plumbing by Housing Type -- 1000's units

| | SFH | MFH | MobH | Other |
|---|---|---|---|---|
| Metropolitan | 271 | 173 | 45 | 26 |
| R. Non-poor | 284 | 15 | 69 | 25 |
| Rural Poor | 150 | 3 | 29 | 11 |
| U.S. Total | 705 | 191 | 143 | 62 |

Source: 1990 Census of Population and Housing.

---

Multi-family housing units (MFH), some larger than 50 dwellings per structure, make up 28 percent of the U.S. housing stock. In rural areas only 12 percent of the housing is multi-family, and these tend to be structures of fewer than 10 units. Inadequate MFH plumbing is predominately an urban problem, and explains only 3 percent of rural substandard housing. Mobile homes (MobH) are 15 percent of the total rural housing stock, but in poor rural areas they make up 19 percent of all housing units. These structures account for 98,000 of the rural substandard housing units. Finally, there are more than 1 million "other" housing units in the U.S., such as houseboats, railroad cars, campers and vans. Overall, about 6 percent of this housing type is plumbing deficient, while the rate in rural areas is two to three times higher.

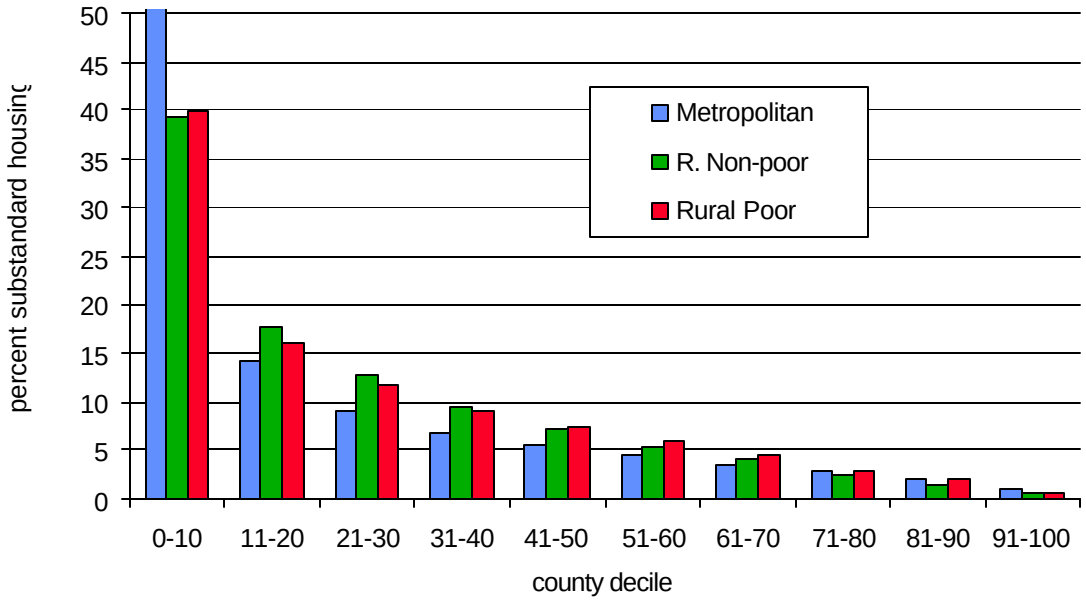
**Occupied housing**.

Occupied housing is a subset of the total housing stock, and represents a variety of household situations; from one person living alone to an extended family living together. A housing unit is any dwelling that constitutes separate living quarters. To be considered occupied, the dwelling must be the usual place of residence for a person or household. On the other hand, vacant housing includes only those units in which no person was living permanently or regularly at the time of the survey. Examples of vacant housing include seasonal recreation properties, empty rental units or houses for sale. Some occasional-use housing is also considered vacant, such as that used by migrant farm workers during the cropping season.

Ten percent of the 102.3 million U.S. housing units are vacant. The vacancy rate in rural America is 15 percent, and the same rate holds in poor rural areas. Vacant housing has a much higher incidence of incomplete plumbing than do occupied units. So while the total U.S. housing stock has 1.1 million units with incomplete plumbing, the occupied housing stock lacks complete facilities in just 720,000 units. Rural America has 586,000 total housing units with incomplete plumbing, but only 327,000 are occupied homes. In poor rural counties, 193,000 houses are without full plumbing, of which 60,000 are vacant. Even after adjusting out the vacant housing units, the same relative disparity exists between urban and rural groups. Metropolitan counties still have only one-half of one percent of their households without complete plumbing. The non-poor rural rate falls from 2.1 percent (for housing units) to just 1.25 percent of (occupied) households are plumbing deficient, while the rural poor rate goes from 5 percent to 4 percent.

Substandard Concentrations. The burden of incomplete plumbing is not evenly distributed within urban or rural county groups. Indeed, a large number of the substandard housing is concentrated in a small portion of each county group. In rural poor counties for instance, 38

percent of the incomplete plumbing households live in just 10 percent of the rural poor counties.




Appendix tables 1-3 list the 20 best and worst counties in rural poor, non-poor, and metropolitan policy groups. The worst five rural poor counties have nearly 18,000 incomplete occupied households, about 8 percent of the rural poor total. Three counties are in Arizona, and two are in New Mexico. These five counties are in a largely native American area, known as the Four Corners region. A significant share of the total housing units there are vacant, and the percentage with incomplete plumbing is higher among vacant units than occupied homes in these counties. The 20 rural poor counties with the lowest incidence of incomplete plumbing have a total of 115 plumbing deficient occupied homes. A similar distribution exists in non-poor rural counties, where several Alaska and Virginia counties top the list of counties with the highest number of occupied housing units with incomplete plumbing. No substandard occupied housing was reported in 38 non-poor rural counties; an area with over 62,300 rural households.

Occupied Housing Characteristic:

Homeownership. Seventy-five percent of rural households own the home in which they live, compared with 62 percent in metropolitan counties. Homeowners, everywhere, are more apt to have complete plumbing, than are renters within the same county group. Renters in poor rural counties have the highest level of incomplete plumbing, followed by homeowners in poverty counties. The only exceptions are when the cohorts are divided further based on the number of persons per room living in the household.

The vast majority of households (95%) have fewer than one person per room, regardless of where they live or their ownership status. For these households, homeowners are always more likely have complete plumbing than are renters. In households with between 1.0 and 1.5 persons per room, the incidence of incomplete plumbing is about the same for owners and renters. But for rural households above 1.5 persons per room, the likelihood of incomplete plumbing is twice as great for homeowners than renters. The worst situation is in poor rural areas, where 32 percent of homeowners (with more than 1.5 persons per room) are living with substandard plumbing, compared to 17 percent for the same group of renters. While these large families represent a very small percentage of the total rural poor households (2%), they are a large share (17%) of the 133,000 rural poor households with incomplete plumbing.

Age of the structure. Eighteen percent of the U.S. occupied housing was built before 1940. These older homes are less likely to have modern plumbing, but the distribution of incomplete plumbing favors newer homes only slightly. Twenty-two percent of rural America's occupied housing is pre-1940's construction, compared to just 12 percent in poor rural areas. Having a newer housing stock concentrates the rural poor substandard units into the remaining pre-1940 structures. Older homes account for 18 percent of the poor rural households with substandard plumbing, compared to 23 percent in non-poor areas. Across rural America, there are 87,000 households living in pre-1940 structures that have substandard plumbing.

Racial and ethnic differences. The largest racial group of rural households are whites, with 16.9 million of the 18.8 million occupied housing units. Blacks account for

nearly 1.4 million rural households. American Indian, Eskimo, and Aleut (AIEA) number over a quarter million households. There are 200,000 households classified as "Other Race" (i.e. multiracial background), and 100,000 of Asian or Pacific Island (API) descent. Rural poverty counties have a similar racial distribution, but a higher percentage of minorities; 1.5 million of the 4.0 million rural poor households are non-white.

Just 1.25 percent of rural white households live without complete plumbing facilities, the smallest percentage of any rural racial group. Yet they represent the largest number of rural households with plumbing deficiencies -- 212,000 (or 70 percent) of the total 327,000 occupied rural households with incomplete plumbing. The rate for whites in poor rural areas is 2.3 percent, and they make up 58,000 (or 44 percent) of the 133,000 plumbing deficient homes.

Rural black households have a 6 percent chance of being without complete plumbing. Poor and non-poor rural counties combined have 77,000 plumbing deficient black households -- 46,000 are in poor counties alone. American Indian, Eskimo, and Aleut in non-poor counties have a 4 percent risk of living in substandard housing, but in poor rural counties that rate jumps to over 22 percent. Thirty-two thousand rural American Indian, Eskimo, or Aleut households lack complete plumbing, and 26,000 of these are in poverty counties. Inadequate plumbing among rural Asian or Pacific Islanders and "Others" is generally below 2 percent. Combined they account for less than 6,000 plumbing deficient rural households.

Table 3. Incomplete Plumbing by Race -- 1000's Households

| | White | Black | AIEA | API/Other Hisp. | |
|---|---|---|---|---|---|
| Metropolitan | 234 | 100 | 5 | 54 | 81 |
| R. Non-poor | 155 | 30 | 6 | 3 | 5 |
| Rural Poor | 58 | 47 | 26 | 3 | 7 |
| U.S. Total | 447 | 177 | 37 | 60 | 93 |

Source: 1990 Census of Population and Housing.

The only ethnic distinction is for households of Hispanic origin, and they are counted as a subset of the racial breakdown. Close to 500,000 Hispanic households live in rural areas. In non-poor counties Hispanic households have a 1.5 percent chance of living with substandard plumbing, while in poor rural counties the rate is three times higher. Just over 12,000 rural Hispanic households live with incomplete plumbing, and 60 percent are in poor rural counties. Hispanics and all of the racial groups have a larger number of incomplete plumbing households in metropolitan areas than in rural areas, except for American Indian, Eskimo, or Aleut. Asians or Pacific Islanders and "Others", as well as Hispanics, are household groups found predominately in metropolitan counties, and their largest numbers of substandard homes are in those counties as well.

The Elderly. Five million rural households are headed by a person 65 years of age or older. Elderly households are more common in rural areas (27%) than in metropolitan counties (21%). Yet regardless of where they live, the elderly are always more likely to living in structures with substandard plumbing. Rural elderly households make up one-third (106,000) of the 327,000 plumbing deficient rural (occupied) housing units. In rural poor counties there are 900,000 elderly households, and 40,000 of them (4.4%) lack complete home plumbing.

**Access to Water and Sewage Collection Systems**.

A significant increase in rural access to sewer and water services accompanied the dramatic reduction in substandard rural housing over the last three decades. The ERS analysis of 1960 Census data found just 32 percent of rural housing were connected to a public or private water system, while only 14 percent had access to public sewage collection. Again, the worst conditions were in rural areas of the East South Central census region, where service was virtually non-existent. Today, sixty-five percent of all rural housing is connected to a water system, and the rate is even higher (69%) in poor rural areas. Water systems must have at least 5 connections, while drilled wells can serve up to 4

housing units. Drilled wells are the water source for 28 percent of non-poor rural housing, and 24 percent of poor rural housing.

Table 4. Source of drinking water -- 1000's housing units

| | Water System | Drilled Well | Dug Well | Other Means |
|---|---|---|---|---|
| Metropolitan | 71,644 | 7,079 | 782 | 352 |
| R. Non-poor | 11,707 | 5,424 | 730 | 590 |
| Rural Poor | 2,718 | 964 | 153 | 120 |
| U.S. Total | 86,068 | 13,467 | 1,664 | 1,063 |

Source: 1990 Census of Population and Housing.

Hand dug wells supply 4 percent of all rural homes, while another 4 percent draw water from some other source; including rivers, lakes, and cisterns. These two categories -- dug wells and other means-- might easily be interpreted as inferior water sources, but this does not appear to be the case for all housing units. The two categories total 2.6 million units, more than twice the number of U.S. housing units with incomplete plumbing. This implies that dug wells and "other" water sources can support the needs of at least 1.5 million housing units well enough for them to be counted as having complete plumbing facilities.

Naturally, the existence of a water system should not be confused with water quality, many systems cannot achieve the most basic standards. In the same way, the mere collection of sewage waste does not guarantee it is safely recycled into the larger water environment. Sewer systems extend to 75 percent of the nation's total housing. But sewage collection reaches only half of all rural housing, and the rate is even lower (45%) in poor rural counties. Septic tanks and cesspools are still used by 25 million U.S. housing units, and over half of these units are in metropolitan counties.

As with substandard plumbing, poor rural areas have a disproportionate share of housing with some "other means" of sewage disposal. The difference between the U.S. total for this category (1,137 thousand) and the housing count for incomplete plumbing (1,101 thousand) is just 36,000 units. Such close estimates suggest that waste disposal is the likely point of failure in the Census complete plumbing test.

Table 5. Method of Sewage Disposal -- 1000's Housing Units

| | Public Sewers | Septic / Cesspool | Other Means |
|---|---|---|---|
| Metropolitan | 65,533 | 13,855 | 469 |
| R. Non-poor | 9,196 | 8,801 | 454 |
| Rural Poor | 1,725 | 2,014 | 214 |
| U.S. Total | 76,455 | 24,670 | 1,137 |

Source: 1990 Census of Population and Housing.

**Summary.**

Rural America has 586,000 housing units with incomplete plumbing facilities, but only 327,000 units are occupied households. Poor rural areas account for 133,000 of all rural plumbing deficient households. The rate of incomplete plumbing is three times higher in these poverty counties than in the rest of rural America. Overall, a small number of counties hold a large portion of the incomplete plumbing households.

Being a minority household, or having an elderly person heading the household, significantly increases the odds of substandard plumbing in the home. Renters live under worse conditions than homeowners, except when large families are living in crowded situations. Structurally speaking, single family homes are less likely than other housing types to have complete plumbing, as are structures built before 1940.

Despite the lingering problems of inadequate plumbing, poor rural areas have a higher level of access to drinking water systems, than non-poor rural areas. Sewage collection, however, is less common in poor rural counties, and the lack of complete household plumbing seems to be linked to the problems of sewage disposal. While rural poor areas still face many challenges, they have experienced dramatic improvements in their access to water and sewer services over the last 30 years.

## References

"Status of rural housing in the United States", by Ronald Bird, Lucia Beverly, and Anne Simmons, Economic Development Division, Economic Research Service, U.S.D.A, Agricultural Economic Reporting No. 144, September 1968.

"Status of Water and Sewage Facilities in Communities without Public Systems", by Lucia H. Beverly, Economic Development Division, Economic Research Service, U.S.D.A, Agricultural Economic Reporting No. 143, October 1968.

"The Revised ERS County Typology: An Overview", by Peggy J. Cook and Karen L. Mizer, Rural Economy Division, Economic Research Service, U.S. Department of Agriculture, Rural Development Report 89.

1990 Census of Population and Housing, STF 3 dataset and related materials, U.S. Department of Commerce, Economics and Statistics Administration.

Appendix table 1. -- Incomplete plumbing: 20 highest and lowest RURAL POOR counties.

| Rank | 20 highest rural poor counties: County or census area | State | Total Housing Units | Vacancy Rate:all housing | Incomplete Plumbing Facilities: Vacant percent | Occupied housing: percent | Occupied housing: number |
|---|---|---|---|---|---|---|---|
| 1 | APACHE COUNTY | AZ | 26,731 | 40% | 47% | 35% | 5,544 |
| 2 | MCKINLEY COUNTY | NM | 20,933 | 21% | 47% | 26% | 4,339 |
| 3 | NAVAJO COUNTY | AZ | 38,967 | 43% | 18% | 18% | 3,931 |
| 4 | COCONINO COUNTY | AZ | 42,914 | 30% | 16% | 8% | 2,392 |
| 5 | SAN JUAN COUNTY | NM | 34,248 | 16% | 26% | 8% | 2,165 |
| 6 | BETHEL CENSUS AREA | AK | 9,261 | 31% | 80% | 55% | 3,538 |
| 7 | HALIFAX COUNTY | NC | 22,480 | 10% | 10% | 7% | 1,342 |
| 8 | NOME CENSUS AREA | AK | 3,684 | 36% | 80% | 42% | 989 |
| 9 | STARR COUNTY | TX | 12,209 | 15% | 13% | 9% | 978 |
| 10 | BREATHITT COUNTY | KY | 6,127 | 9% | 29% | 17% | 928 |
| 11 | WADE HAMPTON CENSUS | AK | 1,882 | 27% | 95% | 66% | 901 |
| 12 | ROBESON COUNTY | NC | 39,045 | 7% | 5% | 2% | 891 |
| 13 | ORANGEBURG COUNTY | SC | 32,340 | 11% | 4% | 3% | 848 |
| 14 | MAVERICK COUNTY | TX | 11,143 | 12% | 20% | 9% | 846 |
| 15 | CLAY COUNTY | KY | 7,930 | 7% | 5% | 11% | 836 |
| 16 | DALLAS COUNTY | AL | 19,045 | 11% | 6% | 5% | 827 |
| 17 | WHITLEY COUNTY | KY | 13,399 | 9% | 7% | 7% | 799 |
| 18 | SAN JUAN COUNTY | UT | 4,650 | 27% | 44% | 23% | 780 |
| 19 | PERRY COUNTY | KY | 11,565 | 8% | 10% | 7% | 768 |
| 20 | LEE COUNTY | VA | 10,263 | 10% | 19% | 8% | 742 |
| | | Total | 368,816 | | | | 34,384 |
| | 20 lowest rural poor counties | | | | | | |
| 516 | WORTH COUNTY | MO | 1,269 | 18% | 25% | 1.0% | 10 |
| 517 | DE BACA COUNTY | NM | 1,329 | 31% | 9% | 1.1% | 10 |
| 518 | HALL COUNTY | TX | 2,189 | 24% | 3% | 0.5% | 9 |
| 519 | CONCHO COUNTY | TX | 1,514 | 30% | 11% | 0.8% | 8 |
| 520 | BOYD COUNTY | NE | 1,538 | 25% | 11% | 0.7% | 8 |
| 521 | DICKENS COUNTY | TX | 1,564 | 31% | 12% | 0.7% | 7 |
| 522 | GRANT COUNTY | ND | 2,011 | 32% | 3% | 0.5% | 7 |
| 523 | BRISCOE COUNTY | TX | 1,074 | 27% | 5% | 0.9% | 7 |
| 524 | REAL COUNTY | TX | 2,049 | 55% | 5% | 0.8% | 7 |
| 525 | UNION COUNTY | KY | 6,091 | 8% | 4% | 0.1% | 6 |
| 526 | MOTLEY COUNTY | TX | 1,026 | 37% | 10% | 0.9% | 6 |
| 527 | FAULK COUNTY | SD | 1,286 | 18% | 30% | 0.6% | 6 |
| 528 | MENARD COUNTY | TX | 1,562 | 40% | 15% | 0.6% | 6 |
| 529 | BAILEY COUNTY | TX | 3,109 | 21% | 3% | 0.2% | 6 |
| 530 | DOUGLAS COUNTY | SD | 1,517 | 11% | 19% | 0.4% | 6 |
| 531 | KIDDER COUNTY | ND | 1,672 | 25% | 5% | 0.2% | 2 |
| 532 | HARMON COUNTY | OK | 1,793 | 17% | 7% | 0.1% | 2 |
| 533 | CASTRO COUNTY | TX | 3,357 | 14% | 0% | 0.1% | 2 |
| 534 | PARMER COUNTY | TX | 3,685 | 12% | 1% | 0.0% | 0 |
| 535 | KENEDY COUNTY | TX | 213 | 32% | 0% | 0.0% | 0 |
| | | Total | 39,848 | | | | 115 |

Source: 1990 Census of Population and Housing.

Appendix table 2. -- Incomplete plumbing: 20 highest and lowest Rural NON-POOR counties.

| Rank | 20 highest rural non-poor counties | State | Total Housing Units | Vacancy Rate: all housing | Incomplete Plumbing Facilities: Vacant percent | Incomplete Plumbing Facilities: Occupied housing percent | Incomplete Plumbing Facilities: Occupied housing number |
|---|---|---|---|---|---|---|---|
| 1 | KODIAK ISLAND BOROUGH | AK | 4,151 | 23% | 79% | 53% | 1,693 |
| 2 | FAIRBANKS NORTH STAR BORO | AK | 31,823 | 16% | 20% | 6% | 1,561 |
| 3 | HAWAII COUNTY | HI | 48,253 | 14% | 8% | 3% | 1,246 |
| 4 | HALIFAX COUNTY | VA | 11,790 | 9% | 9% | 10% | 1,108 |
| 5 | KENAI PENINSULA BOROUGH | AK | 19,364 | 26% | 40% | 7% | 963 |
| 6 | ACCOMACK COUNTY | VA | 15,840 | 20% | 7% | 8% | 958 |
| 7 | MATANUSKA-SUSITNA CENSUS | AK | 20,953 | 36% | 46% | 7% | 938 |
| 8 | MECKLENBURG COUNTY | VA | 14,589 | 23% | 9% | 8% | 852 |
| 9 | GRANVILLE COUNTY | NC | 14,164 | 7% | 13% | 6% | 803 |
| 10 | ROCKINGHAM COUNTY | VA | 22,614 | 8% | 11% | 4% | 771 |
| 11 | MENDOCINO COUNTY | CA | 33,649 | 10% | 10% | 2% | 760 |
| 12 | WASHINGTON COUNTY | ME | 19,124 | 30% | 25% | 5% | 696 |
| 13 | HUMBOLDT COUNTY | CA | 51,134 | 9% | 12% | 1% | 657 |
| 14 | HANCOCK COUNTY | ME | 30,396 | 40% | 9% | 4% | 649 |
| 15 | SCIOTO COUNTY | OH | 32,408 | 8% | 6% | 2% | 647 |
| 16 | FREDERICK COUNTY | VA | 17,864 | 8% | 7% | 4% | 635 |
| 17 | SOUTHAMPTON COUNTY | VA | 6,560 | 8% | 13% | 11% | 631 |
| 18 | PIKE COUNTY | KY | 28,760 | 9% | 6% | 2% | 624 |
| 19 | ROSS COUNTY | OH | 26,173 | 7% | 8% | 2% | 597 |
| 20 | AUGUSTA COUNTY | VA | 21,202 | 7% | 9% | 3% | 586 |
| | | Total | 470,811 | | | | 17,375 |
| | 20 lowest rural non-poor counties | | | | | | |
| 1722 | LANE COUNTY | KS | 1,117 | 14% | 4% | 0% | 0 |
| 1723 | HOOKER COUNTY | NE | 433 | 23% | 1% | 0% | 0 |
| 1724 | ROBERTS COUNTY | TX | 492 | 21% | 1% | 0% | 0 |
| 1725 | MORRILL COUNTY | NE | 2,530 | 18% | 15% | 0% | 0 |
| 1726 | SCOTT COUNTY | KS | 2,305 | 12% | 3% | 0% | 0 |
| 1727 | SHERMAN COUNTY | KS | 3,177 | 14% | 0% | 0% | 0 |
| 1728 | RICH COUNTY | UT | 1,859 | 72% | 3% | 0% | 0 |
| 1729 | LIPSCOMB COUNTY | TX | 1,683 | 27% | 10% | 0% | 0 |
| 1730 | LLANO COUNTY | TX | 9,773 | 46% | 3% | 0% | 0 |
| 1731 | HANSFORD COUNTY | TX | 2,525 | 16% | 8% | 0% | 0 |
| 1732 | CHOUTEAU COUNTY | MT | 2,668 | 23% | 10% | 0% | 0 |
| 1733 | WALLACE COUNTY | KS | 840 | 19% | 5% | 0% | 0 |
| 1734 | KEARNEY COUNTY | NE | 2,756 | 8% | 8% | 0% | 0 |
| 1735 | OLDHAM COUNTY | TX | 861 | 21% | 7% | 0% | 0 |
| 1736 | KIOWA COUNTY | CO | 878 | 25% | 2% | 0% | 0 |
| 1737 | GRANT COUNTY | KS | 2,599 | 8% | 0% | 0% | 0 |
| 1738 | SEWARD COUNTY | KS | 7,572 | 13% | 1% | 0% | 0 |
| 1739 | IRION COUNTY | TX | 842 | 29% | 0% | 0% | 0 |
| 1740 | CHILDRESS COUNTY | TX | 3,046 | 20% | 6% | 0% | 0 |
| 1741 | ARMSTRONG COUNTY | TX | 916 | 16% | 0% | 0% | 0 |
| | | Total | 48,872 | | | | 0 |

Source: 1990 Census of Population and Housing.

Appendix table 3. -- Incomplete plumbing: 20 highest and lowest METROPOLITAN counties.

| Rank | 20 highest metropolitan counties | State | Total Housing Units | Vacancy Rate: all housing | Incomplete Plumbing Facilities: Vacant housing percent | Incomplete Plumbing Facilities: Occupied housing percent | Incomplete Plumbing Facilities: Occupied housing number |
|---|---|---|---|---|---|---|---|
| 1 | LOS ANGELES COUNTY | CA | 3,163,343 | 5% | 1% | 1% | 20,963 |
| 2 | NEW YORK COUNTY | NY | 785,127 | 9% | 2% | 2% | 13,142 |
| 3 | COOK COUNTY | IL | 2,021,833 | 7% | 1% | 1% | 11,394 |
| 4 | KINGS COUNTY | NY | 873,671 | 5% | 1% | 1% | 10,253 |
| 5 | HIDALGO COUNTY | TX | 128,241 | 19% | 5% | 6% | 6,698 |
| 6 | BRONX COUNTY | NY | 440,955 | 4% | 2% | 1% | 6,069 |
| 7 | HARRIS COUNTY | TX | 1,173,808 | 13% | 1% | 1% | 5,676 |
| 8 | DADE COUNTY | FL | 771,288 | 10% | 1% | 1% | 5,383 |
| 9 | SAN FRANCISCO CITY/COUNTY | CA | 328,471 | 7% | 2% | 2% | 4,619 |
| 10 | QUEENS COUNTY | NY | 752,690 | 4% | 1% | 1% | 4,506 |
| 11 | WAYNE COUNTY | MI | 832,710 | 6% | 1% | 1% | 4,333 |
| 12 | SAN DIEGO COUNTY | CA | 946,240 | 6% | 1% | 0% | 4,222 |
| 13 | PHILADELPHIA CITY/COUNTY | PA | 674,899 | 11% | 3% | 1% | 4,036 |
| 14 | DALLAS COUNTY | TX | 795,513 | 12% | 1% | 0% | 3,072 |
| 15 | CAMERON COUNTY | TX | 88,759 | 17% | 3% | 4% | 2,883 |
| 16 | EL PASO COUNTY | TX | 187,473 | 5% | 4% | 2% | 2,808 |
| 17 | BEXAR COUNTY | TX | 455,832 | 10% | 2% | 1% | 2,764 |
| 18 | ORANGE COUNTY | CA | 875,072 | 5% | 0% | 0% | 2,624 |
| 19 | ESSEX COUNTY | NJ | 298,710 | 7% | 3% | 1% | 2,508 |
| 20 | MARICOPA COUNTY | AZ | 952,041 | 15% | 1% | 0% | 2,506 |
| | | Total | 16,546,676 | | | | 120,459 |
| | 20 lowest metropolitan counties | | | | | | |
| 794 | MORTON COUNTY | ND | 9,467 | 8.3% | 7.8% | 0.4% | 33 |
| 795 | OHIO COUNTY | IN | 2,161 | 8.4% | 6.6% | 1.7% | 33 |
| 796 | TIPTON COUNTY | IN | 6,427 | 6.2% | 4.0% | 0.5% | 32 |
| 797 | LOGAN COUNTY | OK | 12,277 | 17.1% | 4.4% | 0.3% | 30 |
| 798 | ROCKWALL COUNTY | TX | 9,816 | 10.0% | 1.8% | 0.3% | 30 |
| 799 | HOOD COUNTY | TX | 14,958 | 25.5% | 3.7% | 0.2% | 27 |
| 800 | MENARD COUNTY | IL | 4,650 | 9.7% | 6.7% | 0.6% | 27 |
| 801 | ANDREW COUNTY | MO | 5,841 | 7.1% | 4.9% | 0.5% | 26 |
| 802 | PIKE COUNTY | PA | 30,852 | 65.8% | 0.6% | 0.2% | 24 |
| 803 | GRUNDY COUNTY | IL | 12,652 | 5.3% | 7.0% | 0.2% | 24 |
| 804 | CASS COUNTY | NE | 8,951 | 12.9% | 6.3% | 0.3% | 22 |
| 805 | LINCOLN COUNTY | SD | 5,823 | 6.2% | 3.0% | 0.4% | 20 |
| 806 | KENDALL COUNTY | IL | 13,747 | 3.2% | 5.4% | 0.1% | 19 |
| 807 | CHATTAHOOCHEE COUNTY | GA | 3,108 | 7.2% | 10.7% | 0.7% | 19 |
| 808 | WOODFORD COUNTY | IL | 11,932 | 4.5% | 7.3% | 0.1% | 17 |
| 809 | POSEY COUNTY | IN | 10,401 | 8.6% | 4.5% | 0.2% | 16 |
| 810 | DAKOTA COUNTY | NE | 6,486 | 7.0% | 2.4% | 0.2% | 11 |
| 811 | GRAND ISLE COUNTY | VT | 4,135 | 51.2% | 1.4% | 0.5% | 11 |
| 812 | ARCHER COUNTY | TX | 3,680 | 19.6% | 3.9% | 0.3% | 9 |
| 813 | LOS ALAMOS COUNTY | NM | 7,565 | 4.7% | 0.0% | 0.0% | 0 |
| | | Total | 184,929 | | | | 430 |

Source: 1990 Census of Population and Housing.