Utah Local Health District and Small Area Designation Algorithm Documentation (effective November 22, 2017)

Why update the algorithm?

Previously, data records could be uncategorized by geography if a particular data element was missing. Records were assigned to local health districts (LHDs) based solely on the county variable and records were assigned to Utah Small Areas based on ZIP Code and county. This difference in methodology presented a number of issues such as a higher number of missing records, inconsistency between LHD data and Small Area data for Small Areas defined as a single LHD, and possible misclassification when the ZIP Code recorded did not fall within the boundaries of the county recorded.

It was determined that using both ZIP Code and county variables would address these issues by providing more assignable records, reducing the number of missing observations, providing consistent data for both LHD and Small Area by applying the same methodology to both, and reducing bias from misclassification by determining a set of rules to be applied to records with inconsistent ZIP and county data.

Analysis and Consideration

Several data sources for ZIP Code information were considered and analyzed to determine validity and geographical boundaries for ZIP Codes including: previous Utah Small Area boundary designations, shape file from Utah Automated Geographic Reference Center (AGRC), USPS ZIP lookup tool (https://tools.usps.com/go/ZipLookupAction_input), population data from the American Community Survey (ACS) 5-year table by ZIP Code Tabulation Areas (ZCTAs), Housing and Urban Development (HUD) United States Postal Service (USPS) ZIP Code Crosswalk Files (downloaded from https://www.huduser.gov/portal/datasets/usps_crosswalk.html), utah.hometownlocator.com, and zipcodedownload.com.

It was decided that AGRC would be the primary source for determining geographic designation of ZIP Codes. Therefore, a map was created on ArcGIS Online overlaying the AGRC shape files for Utah Small Areas and county. The map can be viewed at http://arcg.is/1eLKzi.

In analyzing Small Area assignment using both county and ZIP Code information, it was discovered that several ZIP Codes cross county boundaries and some crossed state boundaries. In these instances, residential ratios from the HUD USPS ZIP Code Crosswalk Files (downloaded from https://www.huduser.gov/portal/datasets/usps_crosswalk.html) were applied.
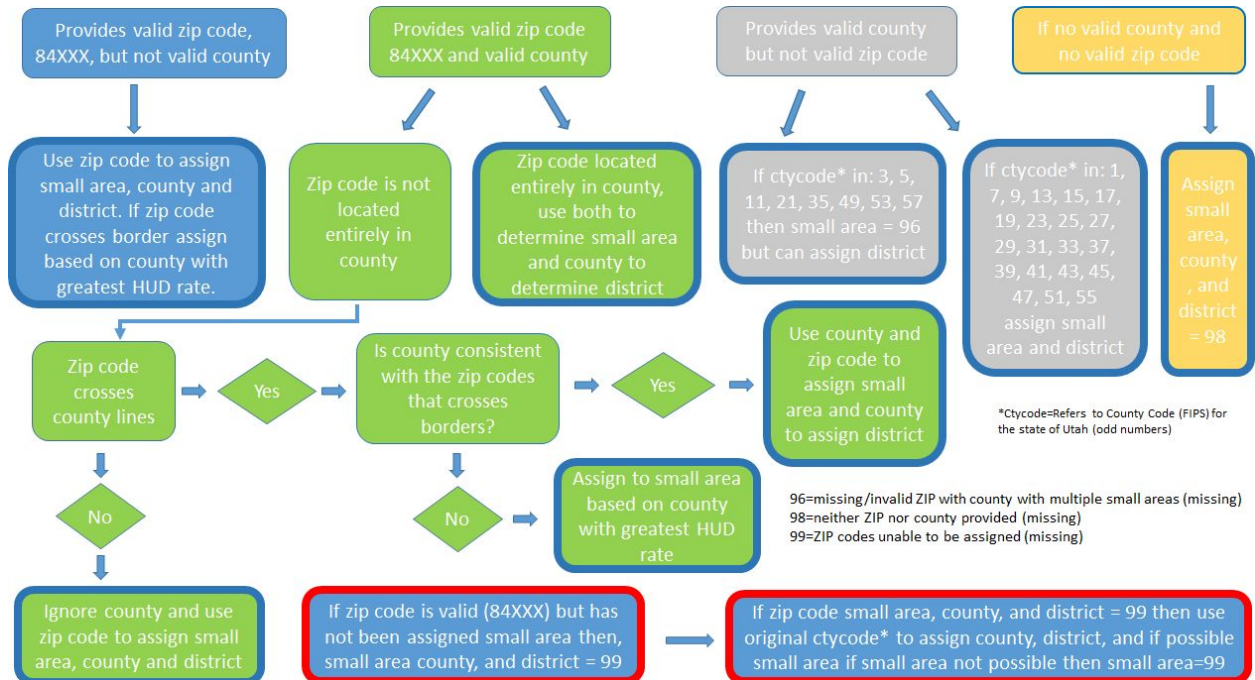
Rules

The following rules were developed to ascertain whether or not a **ZIP Code is valid and which data sources to use for geographic assignment.**
1. Only ZIP Codes beginning with "84---" will be considered valid.
2. If a ZIP Code is classified as a UNIQUE ENTITY ZIP by the USPS (with the exception of colleges and universities) AND is NOT in the AGRC file, assign it to missing; if it is in AGRC, assign it according to AGRC.
3. When a ZIP crosses a county boundary in AGRC and/or HUD, ZIPs are assigned appropriately to multiple counties, according to the source. If there was a discrepancy between AGRC and HUD, AGRC was used to determine assignment.
4. If ZIP Code is not in AGRC or HUD, but a valid ZIP Code according to USPS, utah.hometownlocator.com was used to find the geographic location of the ZIP Code.
5. If ZIP Code is not in AGRC or utah.hometownlocator.com (or if utah.hometownlocator.com pointed to an unusable ZIP), zipcodedownload.com was used to assign geographic location of ZIP Code.
6. If ZIP and county do not match, go with ZIP Code, unless ZIP Code is not assigned, then go with county.

The following rules explain the logic to **assign geographic areas**:
1. If there is *no valid ZIP Code and no valid county* then Small Area, county, and local health district will be assigned missing.
2. If there is a *valid county but not a valid ZIP Code*, then:
   a. For counties that are Small Areas or are a subset of a Small Area you can assign the Small Areas and local health districts (county FIPS of 1, 7, 9, 13, 15, 17, 19, 23, 25, 27, 29, 31, 33, 37, 39, 41, 43, 45, 47, 51, 55)
   b. For counties that have multiple Small Areas contained within them then code Small Area as missing but code local health district based on the county (county FIPS of 3, 5, 11, 21, 35, 49, 53, 57)
3. If there is a *valid ZIP Code and a valid county*, then:
   a. Assess if the ZIP Code is located entirely within the county
      i. When ZIP Code is located entirely within the county then use both county and ZIP Code to assign Small Area and county to assign local health district.

ii. When the ZIP Code is not located entirely within the county (either ZIP Code crosses state or county lines, or the ZIP and county are not consistent).

1. If the ZIP and county do not match then ignore county and use ZIP Code to assign Small Area, county, and local health district.
2. If the ZIP Code crosses county lines and county is consistent with ZIP Code then use county and ZIP Code to assign Small Area and county to assign local health district.
3. If the ZIP Code crosses county lines and county is not consistent with ZIP Code then assign to Small Area and county with greatest HUD rate. Then use that county to assign local health district.

4. If there is a _valid ZIP Code but not a valid county_, then:
   a. Use ZIP Code to assign Small Area, county and local health district. If ZIP Code crosses border, assign Small Area and county based on county with the greatest HUD rate. Then assign local health district based on new county.

5. If, after going through steps above, _there is a valid ZIP Code, but ZIP Code is not assigned to Small Area_ (e.g., some single entity ZIP Codes or post offices) then retain original county and use to assign local health district, and if possible Small Area, otherwise set Small Area to missing
   a. For counties that are Small Areas or are a subset of a Small Area you can assign the Small Areas and local health districts (county FIPS of 1, 7, 9, 13, 15, 17, 19, 23, 25, 27, 29, 31, 33, 37, 39, 41, 43, 45, 47, 51, 55)
   b. For counties that have multiple Small Areas contained within them then code Small Area as missing but code local health district based on the county (county FIPS of 3, 5, 11, 21, 35, 49, 53, 57)

Provides valid zip code, 84XXX, but not valid county

Provides valid zip code 84XXX and valid county

Provides valid county but not valid zip code

If no valid county and no valid zip code

Use zip code to assign small area, county and district. If zip code crosses border assign based on county with greatest HUD rate.

Zip code is not located entirely in county

Zip code located entirely in county, use both to determine small area and county to determine district

If ctycode* in: 3, 5, 11, 21, 35, 49, 53, 57 then small area = 96 but can assign district

If ctycode* in: 1, 7, 9, 13, 15, 17, 19, 23, 25, 27, 29, 31, 33, 37, 39, 41, 43, 45, 47, 51, 55 assign small area and district

Assign small area, county, and district = 98

Zip code crosses county lines

Yes

Is county consistent with the zip codes that crosses borders?

Yes

Use county and zip code to assign small area and county to assign district

*Ctycode=Refers to County Code (FIPS) for the state of Utah (odd numbers)

No

No

Assign to small area based on county with greatest HUD rate

96=missing/invalid ZIP with county with multiple small areas (missing)
98=neither ZIP nor county provided (missing)
99=ZIP codes unable to be assigned (missing)

Ignore county and use zip code to assign small area, county and district

If zip code is valid (84XXX) but has not been assigned small area then, small area county, and district = 99

If zip code small area, county, and district = 99 then use original ctycode* to assign county, district, and if possible small area if small area not possible then small area=99

FIPS Codes for Counties in Utah

County	FIPS County Code
Beaver	1
Box Elder	3
Cache	5
Carbon	7
Daggett	9
Davis	11
Duchesne	13
Emery	15
Garfield	17
Grand	19
Iron	21
Juab	23
Kane	25
Millard	27
Morgan	29
Piute	31
Rich	33
Salt Lake	35
San Juan	37
Sanpete	39
Sevier	41
Summit	43
Tooele	45
Uintah	47
Utah	49
Wasatch	51
Washington	53
Wayne	55
Weber	57

Utah Small Area ID Numbers

Small Area	Small Area ID
Brigham City	1
Box Elder County (Other)	2
Logan	3
Cache County (Other)/Rich County (All)	4
Ben Lomond	5
Morgan County (All)/Weber County (East)	6
Ogden (Downtown)	7
South Ogden	8
Roy/Hooper	9
Riverdale	10
Clearfield/Hill Air Force Base	11
Layton	12
Syracuse/Kaysville	13
Farmington/Centerville	14
Woods Cross/North Salt Lake	15
Bountiful	16
Salt Lake City (Rose Park)	17
Salt Lake City (Avenues)	18
Salt Lake City (Foothill/University of Utah)	19
Magna	20
Salt Lake City (Glendale)	21
West Valley (West)	22
West Valley (East) V2	23.1
Salt Lake City (Downtown)	24
South Salt Lake	25
Millcreek	26
Holladay	27
Cottonwood	28
Kearns V2	29.1
Taylorsville (East)/Murray (West)	30
Taylorsville (West)	30.1
Murray	31
Midvale	32
West Jordan (Northeast) V2	33.2
West Jordan (Southeast)	34.1
West Jordan (West)/Copperton	34.2
South Jordan	35
Sandy (Center)	36
Sandy (Northeast)	37

Sandy (Southeast)	38
Riverton/Draper	39
Tooele County	40
Lehi/Cedar Valley	41
American Fork/Alpine	42
Pleasant Grove/Lindon	43
Orem (North)	44
Orem (West)	45
Orem (East)	46
Provo (North)/Brigham Young University	47
Provo (South)	48
Springville/Spanish Fork	49
Utah County (South)	50
Summit County	51
Wasatch County	52
TriCounty Local Health District	53
Juab/Millard/Sanpete Counties	54
Sevier/Piute/Wayne Counties	55
Carbon/Emery Counties	56
Grand County	57.1
San Juan County	57.2
St. George	58
Washington County (Other)	59
Cedar City	60
Southwest Local Health District (Other)	61
missing/invalid ZIP with county with multiple Small Areas (missing)	96
neither ZIP nor county provided (missing)	98
ZIP codes unable to be assigned (missing)	99