The Regional Pattern of Folk Belief Carriers and Its Influencing Factors: A Case Study of Temple Culture in Yuzhong County, Lanzhou City (Post-print)

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Abstract

Folk beliefs centered on temple rituals with well-preserved temples constitute an important component of folk culture in the Longzhong region of Gansu Province. Characterized by strong convergence, these beliefs in the Longzhong region are examined through a case study of Yuzhong County, where village temples serve as carriers of folk culture. Employing methods such as kernel density analysis and Logistic regression, this study investigates the spatial distribution of these folk culture carriers and their influencing factors, which holds significant importance for understanding human-land relationships in the Longzhong region and for protecting and promoting folk culture. The research findings indicate: (1) Based on existing studies, folk beliefs in Yuzhong County are categorized into mountain deity belief, water deity belief, heaven and earth belief, female deity belief, hero worship, and ancestor worship, with ancestor worship temples occupying a significant position in terms of quantity; (2) Temples in Yuzhong County are mainly distributed along the southern bank of the Yellow River in the northwest, along the Longhai Railway in the central region, and in scenic spot clusters in the south. Spatial differences are not significant at the village level but relatively pronounced at the township level. Kernel density analysis reveals that different categories of folk beliefs exhibit distinct spatial distribution hotspots; (3) The spatial distribution of folk beliefs in Yuzhong County is constrained by locational conditions, with temples predominantly situated in areas with lower elevation, higher population density, and better transportation accessibility. Slope and distance to water sources emerge as significant influencing factors for the spatial distribution of mountain deity belief and water deity belief temples, respectively. Temples in Yuzhong County demonstrate spatial characteristics where mountain deity belief temples are "mountain-adjacent"

while water deity belief temples are "water-adjacent."

Full Text

Preamble

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Abstract

Geographical environment exerts a profound influence on the formation of regional culture. This study examines temples in Yuzhong County as a case study, considering the cultural and folk religious similarities in the Longzhong region of Gansu Province, with the aim of enriching research in cultural geography. The paper investigates the spatial distribution patterns of folk temples and their underlying influencing factors. Research data were collected through literature review and field investigation, with temple types classified according to belief categories. Kernel Density Estimation (KDE) and logistic regression analysis were employed to analyze the spatial distribution characteristics and influencing factors of temples. The main findings are as follows: (1) Folk religion in Yuzhong County can be categorized into natural belief, fairy belief, and personality belief, with water god worship and ancestor worship constituting the predominant temple types. (2) Temples exhibit significant agglomeration in three regions: the northwestern area (along the banks of the Yellow River), the central area (along both sides of the Longhai Railway), and southern scenic regions, indicating that

temple distribution is strongly shaped by regional culture. (3) The spatial distribution of temples is also constrained by geographical conditions. Temples in Yuzhong County are predominantly located in low-altitude areas with high population density and good traffic accessibility. Mountain god temples tend to be situated near mountains, while water god temples are typically located close to rivers. Based on collected temple data, this paper quantitatively discusses the influencing factors on temple distribution using mathematical methods, aiming to provide suggestions for the protection of traditional culture by revealing the characteristics of folk beliefs in the study area.

Keywords: Yuzhong County; temples; folk belief; spatial distribution; impact factors; KDE; Logistic regression

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1. Study Area and Methodology

1.1 Study Area Overview

Yuzhong County is located in the central part of Gansu Province, situated in the transitional zone between the Qinghai-Tibet Plateau, Loess Plateau, and Inner Mongolia Plateau. The county spans approximately 3,301 km², with elevations ranging from 1,358 m to 3,670 m. The terrain slopes from southwest to northeast, characterized by gullies and fragmented landscapes. The northern region consists primarily of loess hilly areas, while the central region features valley basins. The southern region comprises mountainous terrain with elevations between 1,500–2,000 m, forming a natural barrier. The county seat lies at an elevation of 1,720 m. The study area exhibits distinct vertical zonation, with significant variations in climate, vegetation, and land use patterns across different altitude zones [Figure 1: see original paper].

[Figure 1: see original paper] Location of the study area

The cultural landscape of Yuzhong County reflects typical Longzhong regional characteristics, with folk beliefs representing an important component of local culture. Previous studies have documented the spatial distribution of various cultural elements in this region [26–28], including the relationship between religious landscapes and geographical environments [11], as well as the evolution of belief systems [21]. However, quantitative analysis of folk temple distribution patterns remains limited.

1.2 Data Sources and Processing

Temple data were obtained from the *Yuzhong County Gazetteer (2013)* and supplemented with field investigations conducted in 2016. A total of 267 temples were documented and geocoded. Using ArcGIS 10.2, a spatial database was constructed containing temple locations, types, and attribute information. For kernel density analysis, the optimal bandwidth was determined using the Silverman rule-of-thumb method:

$$h = 0.9 \times \min(SD, \frac{IQR}{1.34}) \times n^{-1/5}$$

where h represents the bandwidth, SD is the standard distance, IQR is the interquartile range, and n is the number of observations. The kernel density estimation was performed using the following function:

$$\hat{f}(x) = \frac{1}{nh} \sum_{i=1}^{n} K\left(\frac{x - x_i}{h}\right)$$

where K represents the kernel function. In this study, a quadratic kernel function was employed to calculate temple density surfaces.

For logistic regression analysis, the study area was divided into 1 km × 1 km grid cells, generating 3,301 sampling units. Each grid cell was assigned a binary value (1 = presence of temple, 0 = absence). Ten influencing factors were selected based on previous research [17–18, 20, 24, 30] and theoretical considerations, including topographic, socioeconomic, and accessibility variables .

Summary of influencing factors and their descriptions

The logistic regression model was specified as:

$$P(Y = 1|X) = \frac{\exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k)}{1 + \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k)}$$

where P represents the probability of temple occurrence, $x_1, x_2, \ldots, x_k$ are independent variables, and $\beta_0, \beta_1, \ldots, \beta_k$ are coefficients estimated using maximum likelihood estimation. Model performance was evaluated using the Hosmer-Lemeshow test and ROC curve analysis.

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2. Spatial Distribution Patterns of Temples

Kernel density analysis reveals three major agglomeration centers of temples in Yuzhong County. The first cluster is located in the northwestern region along the Yellow River corridor, where water god temples dedicated to river deities are concentrated. The second cluster aligns with the Longhai Railway corridor in the central valley, where population density and accessibility are highest. The third cluster appears in the southern mountainous scenic area, where mountain god temples and tourist-related religious sites are prevalent.

The distribution exhibits a clear distance-decay pattern from these core areas, with temple density decreasing significantly beyond 5 km from major settlements and transportation routes. This pattern reflects the dependence of folk religious activities on both population distribution and geographical accessibility.

2.1 Relationship with Population Density

Statistical analysis indicates a significant positive correlation between village population density and temple number (r = 0.72, p < 0.01) [Figure 7: see original paper]. Villages with populations exceeding 1,000 inhabitants host an average of 2.3 temples, while those with fewer than 500 residents average only 0.4 temples. This relationship underscores the role of population size in sustaining religious infrastructure and activities.

[Figure 7: see original paper] Relationship between village population density and the number of temples

2.2 Relationship with Accessibility

Accessibility, measured by distance to county roads and railway stations, shows a negative correlation with temple density [Figure 8: see original paper]. Areas within 2 km of major transportation routes contain 68% of all temples, while regions more than 5 km from roads account for merely 8% of temples. The logistic regression model confirms that accessibility is a significant predictor (= -0.34, p < 0.001), with each kilometer increase in distance reducing the odds of temple presence by 29%.

[Figure 8: see original paper] Relationship between villages' accessibility and the number of temples

2.3 Relationship with Natural Features

Water god temples demonstrate strong spatial affinity to rivers, with 84% located within 1 km of permanent watercourses [Figure 9: see original paper]. The mean distance from water god temples to the nearest river is 0.6 km, significantly closer than other temple types (p < 0.001). Similarly, mountain god temples cluster near mountain foothills, with elevations typically 200–500 m lower than peak elevations but higher than valley settlements.

[Figure 9: see original paper] Relationship between the distance to the river and the number of river god belief temples

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3. Influencing Factors Analysis

Logistic regression results identify six significant factors affecting temple distribution at the 95% confidence level: altitude (= -0.18), slope (= -0.12), population density (= 0.24), distance to roads (= -0.34), distance to rivers (= -0.21), and distance to urban centers (= -0.15). The model correctly classifies 78.3% of grid cells, with an AUC value of 0.82, indicating good predictive performance.

The negative coefficients for topographic variables confirm that temples favor gentler terrain and lower elevations, facilitating construction and access. Positive population effects reflect the demand-side drivers of religious facility provision. The significance of road and river proximity highlights the dual influence of cultural geography—temples require both human accessibility (roads) and symbolic natural features (rivers) for deity worship.

3.1 Cultural Regionalism Effects

The spatial distribution patterns align closely with the cultural sub-regions of Longzhong. The Yellow River corridor represents a distinct belief zone centered on water deities, reflecting historical irrigation-based agriculture and flood control concerns. The railway corridor corresponds to modern settlement patterns and commercial activities, where temples serve both religious and social functions. The southern mountain zone exhibits ecological-religious characteristics, where mountain worship integrates with nature conservation beliefs.

3.2 Quantitative Interpretation

The odds ratios derived from logistic coefficients reveal that population density has the strongest positive effect (OR = 1.27), while road accessibility shows the strongest negative distance effect (OR = 0.71). Specifically, a one-standard-deviation increase in population density increases temple probability by 27%, whereas each kilometer farther from a major road decreases probability by 29%. These quantitative relationships provide a robust basis for understanding the socio-geographical mechanisms underlying folk religious landscape formation.

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4. Discussion and Conclusions

This study demonstrates that temple distribution in Yuzhong County results from the interplay between cultural traditions and geographical constraints. The three-cluster pattern reflects both historical settlement patterns and contemporary accessibility. Water god temples' riparian distribution exemplifies how natural hazards (floods) shape religious responses, while the railway corridor' s temples illustrate modern infrastructure' s role in cultural landscape evolution.

The findings contribute to cultural geography by quantifying relationships between belief systems and environmental factors. The methodological combination of KDE and logistic regression offers a replicable framework for analyzing religious geography in other regions. For cultural heritage protection, the results suggest that temples within 2 km of roads and 1 km of rivers should be prioritized for preservation, as these areas contain the highest concentration of culturally significant sites.

Future research should incorporate temporal dynamics to examine how temple distributions have evolved with socioeconomic changes, and extend the analysis

to compare patterns across different cultural regions of Northwest China.

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Note: Figure translations are in progress. See original paper for figures.