

# Common Nutrition-Related ICD-10 Codes in Louisiana and Alabama: A Comparative Retrospective Analysis

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## Abstract

**Background:** Nutrition-related conditions, including malnutrition and food insecurity, disproportionately affect rural and medically underserved populations. Louisiana and Alabama exhibit regional disparities in food insecurity and socioeconomic factors that contribute to nutritional risk. Evaluating documentation of nutrition-specific ICD-10 codes at a medical school's Rural and Medically Underserved Population (RMUP) clinical rotation sites may identify gaps in recognition of nutritional needs and inform targeted clinical and educational interventions. **Methods:** We conducted a retrospective observational study of adult patient encounters documented in the Clinical Rotation Evaluation and Document Organizer (CREDO) database at Edward Via College of Osteopathic Medicine (VCOM)-affiliated Rural and Medically Underserved Population (RMUP) clinical sites in Alabama and Louisiana between March 2022 and December 2023, classifying ICD-10 codes into nutrition-status categories using Academy of Nutrition and Dietetics criteria. **Results:** A total of 34,967 ICD-10 codes were analyzed. Direct nutrition-status codes were infrequently documented across both states, including low utilization of codes for dietary counseling and food insecurity. In contrast, chronic disease diagnoses such as hypertension and type 2 diabetes mellitus were frequently recorded but did not reflect nutritional status. The Endocrine, Nutrition, and Metabolic category showed a modest but statistically significant difference between states ( $p < 0.05$ ). **Conclusion:** Nutrition-specific ICD-10 codes capturing malnutrition, nutritional deficiencies, and food insecurity were underutilized at RMUP clinical sites in both Alabama and Louisiana. These findings highlight opportunities to improve nutrition-focused assessment, documentation, and education in rural and underserved clinical settings.

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## Keywords

Malnutrition, Rural Health, Medical Students, Medical Education, International Classification of Diseases, Food Insecurity, Nutritional Assessments

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## 1. Introduction

Nutrition is a critical determinant of health and is closely linked to disease prevention, recovery, and long-term health outcomes. Malnutrition, micronutrient deficiencies, overnutrition, and food insecurity are associated with increased morbidity, prolonged illness, and higher healthcare utilization [1]. Nearly half of American adults have one or more preventable chronic diseases for which poor nutrition is a key risk factor [2]. Despite this burden, nutrition-related conditions remain underrecognized in clinical practice, even though the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) includes specific codes designed to document nutritional status and nutrition-related challenges.

Food insecurity, a household-level economic and social condition characterized by limited or uncertain access to adequate food, affects millions of individuals nationwide and disproportionately impacts rural and economically disadvantaged populations [3]. In 2023, 13.5% of U.S. households experienced food insecurity, with higher average rates reported in Louisiana (LA) than in Alabama (AL) [4]-[6]. These regional disparities highlight the importance of accurately identifying nutrition-related challenges, especially in rural and medically underserved (RMUP) settings where socioeconomic barriers, limited access to healthy foods, and healthcare shortages coexist.

Although nutrition influences the prevention and management of many chronic diseases, including diabetes mellitus, hypertension, and chronic kidney disease, these conditions are multifactorial in origin and do not directly indicate nutritional status. Thus, using chronic disease diagnoses as proxies for nutrition obscures malnutrition and food insecurity coding data and risks reinforcing stigma and patient blame. ICD-10-CM provides a distinct set of diagnostic codes that explicitly capture malnutrition, nutritional deficiencies, overnutrition, disorders of food intake, food insecurity, and dietary counseling; however, the extent to which nutrition-specific codes are used in routine documentation at RMUP clinical sites remains unclear.

Medical students rotating through RMUP clinical sites often contribute to patient encounter documentation under the supervision of licensed healthcare professionals. Evaluating how nutrition-related ICD-10-CM codes are used in this setting may provide insights into documentation practices, clinical exposure, and opportunities for targeted coding education during clinical training. Therefore, the objective of this study was to evaluate the frequency and distribution of ICD-

10-CM codes identified by the Academy of Nutrition and Dietetics (AND) as warranting referral to a registered dietitian nutritionist (RDN), using student-entered data from the Clinical Rotation Evaluation and Document Organizer (CREDO) at Edward Via College of Osteopathic Medicine (VCOM) [7]. Additionally, we compared coding patterns between RMUP clinical sites in LA and AL to assess whether geographic context influences clinical exposure and documentation of nutrition-related conditions.

## 2. Methods

This study was a retrospective, cross-sectional observational analysis of ICD-10-CM diagnostic codes documented during clinical encounters at VCOM-affiliated RMUP sites in AL and LA. Data were derived from patient encounters recorded between March 1, 2022, and December 31, 2023.

Patients ( $\geq 19$  years) seen at RMUP primary care sites whose encounters were logged in the CREDO database were included in the analysis. CREDO is a structured, Health Insurance Portability and Accountability Act (HIPAA)-compliant electronic system developed by VCOM for internal use by students to document patient encounters. At the time of this study, third-year medical students entered data into the CREDO system based on clinical documentation completed during patient encounters. All encounters occurred under the oversight of licensed preceptors responsible for patient care; however, ICD-10-CM entries used for this analysis were not audited for coding accuracy prior to extraction. Encounters from non-RMUP sites and from VCOM's additional campuses in Virginia and South Carolina were excluded using geographic coordinate identifiers and site-specific filters.

ICD-10-CM codes were exported from CREDO into Microsoft Excel and filtered by campus. Pivot tables were generated to summarize the total number of ICD-10-CM entries recorded during various RMUP rotations.

Nutrition-related ICD-10-CM codes were extracted into a separate dataset using a published reference list from the AND. This list includes ICD-9-CM and ICD-10-CM diagnoses for which individuals may be referred to an RDN for medical nutrition therapy (MNT). The AND developed this list based on findings from its 2013 Coding Survey, which identified diagnoses most commonly associated with RDN reimbursement.

The AND categorized these ICD-10-CM codes into overarching groups based on body system or condition type (e.g., Endocrine, Nutritional and Metabolic Diseases; Diseases of the Digestive System, etc.). The ten most frequently represented AND categories identified in this study are summarized in **Figure 1**. Additionally, a comparison table was created to evaluate differences in ICD-10-CM code distributions between AL and LA RMUP sites. To ensure consistency in data categorization, three investigators independently reviewed and assigned ICD-10-CM codes to their respective AND categories.

ICD-10-CM codes were treated as categorical variables and summarized as fre-

quencies and proportions. Code counts were aggregated by AND category and campus location for analysis. Descriptive statistics were used to summarize ICD-10-CM code frequencies. Statistical analysis was performed using SigmaPlot 14.0. Due to the exploratory and retrospective nature of this study, observed differences in coding frequencies between states were interpreted as descriptive rather than confirmatory findings.

The VCOM Institutional Review Board determined that this study was exempt from review. The study involved secondary analysis of de-identified data and included no direct patient contact. No external funding, compensation, or financial support was received.

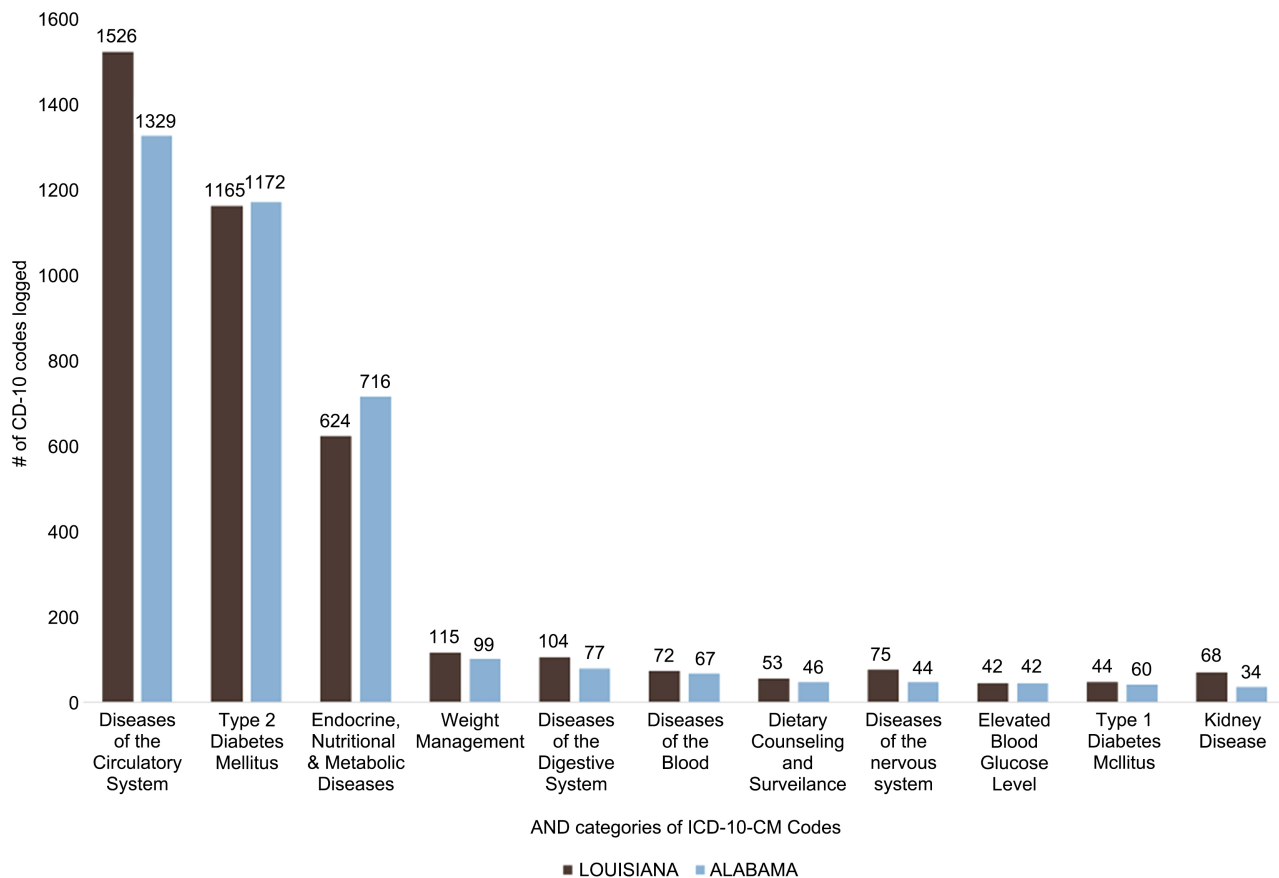


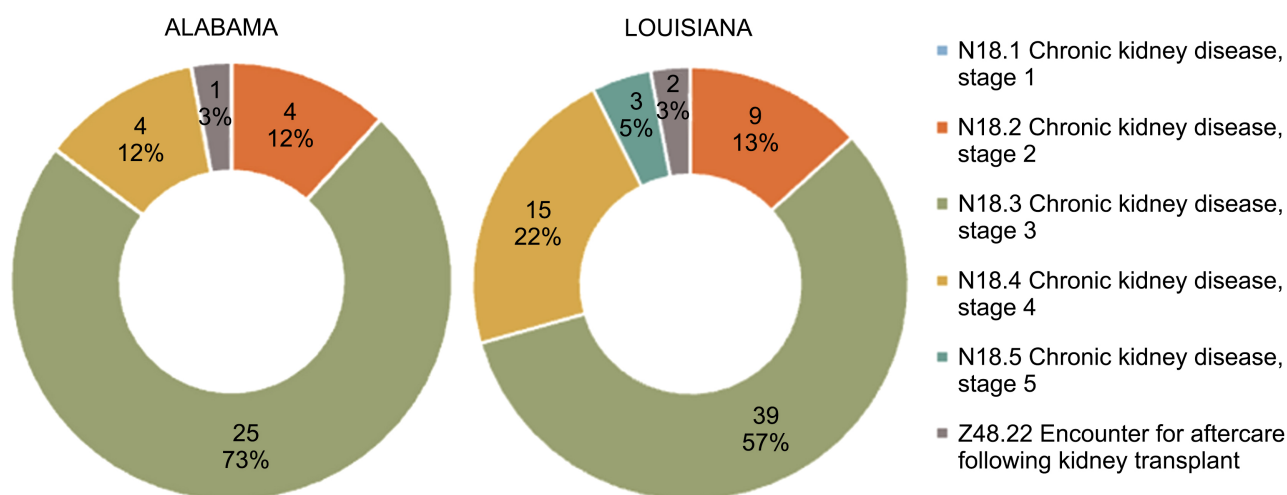
Figure 1. Top ten AND ICD-10-CM code categories for MNT.

### 3. Results

A total of 34,967 ICD-10-CM codes were analyzed, including 15,896 entries from AL sites and 19,071 entries from LA sites. Because CREDO exports were de-identified at the code-entry level, unique patient counts could not be determined. To further compare state-specific coding patterns, the ten most commonly documented AND-designated ICD-10-CM codes were identified separately for LA and AL. Among these, primary hypertension (I10), type 2 diabetes mellitus (E11), and hyperlipidemia (E78.5) were the three most frequently recorded nutrition-related

diagnoses in both states. The distribution of these diagnoses by state is presented in **Figure 1**, demonstrating comparable frequencies between AL and LA RMUP sites.

Chronic kidney disease (CKD) diagnoses were examined by stage using ICD-10-CM classification aligned with Kidney Disease Improving Global Outcomes (KDIGO) and Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines [8]-[10]. The distribution of CKD stages differed modestly between states and is illustrated in **Figure 2**. Across all RMUP sites, stage 3 CKD (N18.3) was the most frequently documented classification and comprised the majority of CKD-related encounters.



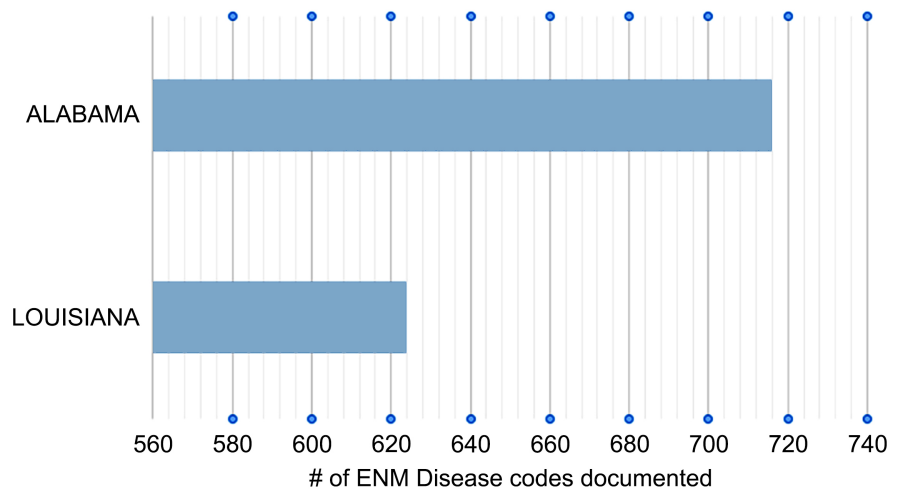
**Figure 2.** Distribution of chronic kidney disease ICD-10-CM stage classifications documented during rural and medically underserved primary care encounters in Alabama and Louisiana.

Comparative analysis of AND diagnostic categories demonstrated modest differences in documentation frequency between states, most notably within the Endocrine, Nutrition, and Metabolic (ENM) category. ENM-related codes represented 4.5% (716/15,896) of ICD-10-CM entries at AL RMUP sites compared with 3.3% (624/19,071) at LA RMUP sites (**Figure 3**). The specific ENM diagnoses contributing most to this difference were hypothyroidism (E03.9) and hyperlipidemia (E78.5).

Dietary counseling utilization was assessed by analyzing the documentation frequency of ICD-10-CM code Z71.3 (Dietary counseling and surveillance). This code represented a small proportion of documented codes in both states, accounting for 0.28% (53/19,071) of LA entries and 0.29% (46/15,896) of AL entries. Similarly, ICD-10 codes for malnutrition, food insecurity, micronutrient deficiencies, and disorders of food intake were rare across all sites.

Direct nutrition-status coding remained rare across both states. Malnutrition-related ICD-10-CM codes accounted for less than 1% of all documented entries in both LA and AL RMUP encounters. Similarly, codes related to food insecurity, micronutrient deficiencies, and disorders of food intake were infrequently rec-

orded across both datasets. Food insecurity documentation using ICD-10-CM code Z59.41 and related social determinant codes was uncommon in both states.



**Figure 3.** Endocrine, nutrition, and metabolic (ENM) disease ICD-10-CM codes in Alabama vs. Louisiana.

#### 4. Discussion

Direct nutrition-status ICD-10-CM codes capturing malnutrition, micronutrient deficiencies, food insecurity, and dietary counseling were infrequently documented at VCOM-affiliated RMUP clinical sites in AL and LA. In contrast, chronic disease diagnoses commonly encountered in primary care, such as hypertension, type 2 diabetes mellitus, hyperlipidemia, and chronic kidney disease, were frequently recorded but do not directly reflect nutritional status. This discrepancy limits the ability to assess how nutrition-related conditions and social needs may be contributing to the chronic disease burden in rural and medically underserved populations.

Across both states, documentation patterns were dominated by chronic disease codes that often co-occur with nutrition-related risk factors (Figure 1, Figure 2). However, these diagnoses are multifactorial and should not be interpreted as proxies for malnutrition, overnutrition, or food insecurity. Reliance on chronic disease coding alone may obscure the identification of patients experiencing nutrition-specific challenges and constrain opportunities to evaluate nutrition-focused interventions or referral practices.

The low documentation frequency of ICD-10-CM codes for dietary counseling (Z71.3) suggests that nutrition-focused screening, counseling, or coding may not be consistently captured during RMUP encounters. Because this analysis is based on coded documentation rather than direct observation of clinical care, it is unknown whether these findings reflect primarily under-screening or under-coding by practitioners at these clinical sites. Structural factors common to rural primary care, including limited visit time, competing clinical priorities, and variable access to dietetic services, may further influence code selection patterns [11].

Chronic kidney disease staging patterns provide an illustrative example of this distinction. Stage 3 CKD (N18.3) was the most frequently documented CKD classification across sites (**Figure 2**), consistent with recognition of progression to moderate disease severity. While CKD staging itself is not a nutrition-status measure, early intervention at stage 3 CKD is critical for optimizing patient outcomes and minimizing the economic burden of the disease (i.e., progression to requiring dialysis). Although kidney damage is typically irreversible at this stage, timely management and nutritional education can delay progression. It is recommended that at stage 3 or higher CKD, protein intake should be approximately 0.8 g/kg/day. Additionally, sodium restriction can often aid in blood pressure control, and addressing electrolyte imbalances (e.g., potassium, calcium) can help preserve kidney function as eGFR declines [12]. This provides a demonstration of a chronic health condition that was most commonly documented at a stage where nutritional intervention is instrumental in long-term management.

At the diagnostic category level, ENM-related codes were more frequently documented at Alabama RMUP sites than at Louisiana sites (**Figure 3**). Differences were driven primarily by hypothyroidism and hyperlipidemia coding and may reflect variation in population health, diagnostic practices, or site-specific documentation patterns. These findings should be interpreted descriptively, as the analysis was based on encounter-level coding and did not account for clustering by student, clinic, or preceptor. However, this diagnostic category is another area where nutrition has clinical relevance. For example, thyroid hormone has roles in regulating metabolism, affecting weight management and utilization of energy [13]. Additionally, the standard of care for management of hypothyroidism is replacement with levothyroxine [14], and its absorption is known to be affected by certain foods and medications [15]. These alone are not necessarily a reason for referral to RDNs, but they are points of nutrition-relevant counseling for medical students to consider during their training. Dietary modifications also have a role in the management of hyperlipidemia and are important for patient counseling, considering the increased risk for cardiovascular disease. Dietary interventions include increasing unsaturated fats, fiber, and plant protein intake, and decreasing saturated and trans-fat intake [16].

This study is subject to limitations inherent in retrospective analyses of coded encounter data. ICD-10-CM entries were recorded by medical students, introducing potential variability in coding completeness and accuracy, although all encounters were supervised by licensed preceptors. Coding practices in this educational setting differ from real-world clinical environments, where documentation and diagnostic coding may be influenced by billing, reimbursement structures, quality metrics, or administrative oversight; however, the absence of financial incentivization may also reduce certain coding biases observed in routine clinical practice, including more intensive diagnostic coding in hospitals serving higher proportions of privately insured patients [17]. The unit of analysis was ICD-10-CM code entries rather than unique patients, limiting inference regarding preva-

lence. Additionally, the new ICD-11-CM code for adult undernutrition, designed to capture unintentional weight loss, muscle mass loss, or low body mass index in adult patients, will be implemented in 2027 and could not be assessed in this analysis due to its study period [18]. Finally, findings are limited to adult RMUP encounters in AL and LA and are not generalizable to pediatric or non-RMUP settings.

Nevertheless, this study provides foundational characterization of nutrition-related diagnostic patterns in an educational clinical environment and highlights important opportunities for future research as coding systems and clinical practices continue to evolve. These findings underscore the potential to leverage medical student-patient encounters as meaningful opportunities for nutritional counseling and education, and to inform targeted enhancements in medical education curricula that better ensure medical students are adequately prepared to document nutrition counseling, RDN referral, and related evaluations during training and independent clinical practice.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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