Beyond Type 1 and Type 2: Exploring 'Type 3' Diabetes as the Undiagnosed Burden

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COMMENTARY

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ABSTRACT

This commentary examines the persistent and clinically significant burden of undiagnosed diabetes in the United States and proposes the conceptual framing of this population as "Type 3 Diabetes." Drawing on National Health and Nutrition Examination Survey data and recent estimates from the Centers for Disease Control and Prevention and the National Institute of Diabetes and Digestive and Kidney Diseases, the article highlights that millions of U.S. adults meet biochemical criteria for diabetes yet remain unaware or undiagnosed, despite measurable improvements in detection. To explain the persistence of this hidden burden, the paper integrates the Health Belief Model, PRECEDE–PROCEED, and the Social Determinants of Health frameworks, illustrating how individual risk perceptions, health system practices, and structural inequities interact to delay screening, diagnosis, and classification.

Framing undiagnosed diabetes as a distinct phase of disease underscores its clinical risks, equity implications, and the systemic factors that perpetuate under-recognition in high-burden regions and populations. The commentary further positions emerging artificial intelligence and machine learning approaches as promising multilevel tools to enhance early detection, support risk stratification, and strengthen alignment between clinical practice and public health infrastructure. Together, this integrated conceptual approach underscores the importance of naming, measuring, and addressing undiagnosed diabetes as a central challenge in diabetes prevention and control, with implications for clinicians, public health practitioners, and policymakers alike.

Key Words: Type 3 diabetes, hyperglycemia, health system practices, cardiometabolic risk factors, undiagnosed diabetes.

INTRODUCTION

Diabetes mellitus is conventionally classified into Type 1 and Type 2, with gestational diabetes recognized as a distinct clinical entity. This taxonomy has guided clinical practice, research funding, and public understanding for decades. Yet a substantial share of diabetes in the United States (U.S.) falls outside this diagnostic framework, not because it reflects a novel pathophysiology but because it remains undetected. Historically, analyses of National Health and Nutrition Examination Survey [1] (NHANES) data suggested that roughly one-third of U.S. diabetes cases were undiagnosed. Recent surveillance data illustrate the scope and geographic variation of diabetes in the United States. According to the 2026 National Diabetes Statistics Report from the Centers for Disease Control and Prevention [2] (CDC), an estimated 40.1 million Americans were living

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with diabetes in 2023 (diagnosed or undiagnosed), representing approximately 12.0% of the U.S. population; of these, 27.6% (around 11.0 million adults) were undiagnosed, underscoring the persistence of a substantial hidden disease burden. State-level data further reveal pronounced disparities in prevalence, with southern and Appalachian states exhibiting the highest adult diabetes rates: West Virginia (~18.2%), Mississippi (~17.0%), Louisiana (~16.1%), Alabama (~15.7%), and South Carolina (~14.9%) rank among the highest nationally. These findings highlight the uneven distribution of metabolic disease across the country and reinforce the importance of targeted screening and early recognition efforts, especially in regions with the greatest burden, to address both diagnosed and undiagnosed diabetes within the conceptual framing of "Type 3 Diabetes."

Undiagnosed diabetes is not a benign state. Individuals with unrecognized hyperglycemia often present late in the disease course, with established microvascular and macrovascular complications, higher health care utilization, and worse long-term outcomes. From a public health perspective, undiagnosed diabetes represents a surveillance gap; from a clinical perspective, it represents missed opportunities for early intervention. In this commentary, it is proposed that undiagnosed diabetes be conceptualized as Type 3 Diabetes, not as a new biological subtype but as a heuristic to enhance visibility, urgency, and accountability across clinical and population health systems, and to consider how this might be addressed at the policy level.

Integrated Framework Explanation

Integrating the Health Belief Model (HBM), PRECEDE–PROCEED, and the Social Determinants of Health (SDOH) provides a comprehensive explanation for why diabetes remains persistently under diagnosed in the U.S. At the individual level, the HBM clarifies how low perceived susceptibility, limited symptom awareness, competing life priorities, and perceived barriers to care reduce engagement in screening and follow-up, even among high-risk populations [3,4]. However, individual beliefs alone are insufficient to explain sustained under diagnosis. The PRECEDE–PROCEED framework expands this understanding by highlighting how health system factors, such as inconsistent screening implementation, limited preventive encounters, inadequate provider communication, and weak referral pathways, enable undiagnosed disease to persist despite the availability of diagnostic tools and evidence-based guidelines [3,4,5].

Critically, both behavioural and system-level processes are embedded within broader social and structural conditions articulated by the SDOH framework. Disparities in income, insurance coverage, education, housing stability, and exposure to chronic stress disproportionately affect populations with the highest diabetes burden, increasing biological risk and the likelihood of remaining undiagnosed. Together, these frameworks suggest that undiagnosed diabetes, or "Type 3 Diabetes," is not simply a failure of individual health-seeking behaviour but the cumulative result of misaligned beliefs, fragmented health systems, and structural inequities. This integrated model supports multilevel strategies, including the use of artificial intelligence/machine learning (AI/ML), new tools and apparatus, screening, community-based interventions, and policy-level reforms, to improve early detection and reduce the hidden burden of diabetes [3, 5, 6].

Clarifying "Undiagnosed" and "Unrecognized" Diabetes

In the diabetes literature, the terms undiagnosed and unrecognized diabetes are often used interchangeably, yet they represent distinct and important concepts that shape surveillance, clinical response, and policy interpretation. Undiagnosed diabetes typically refers to individuals who meet established biochemical criteria for diabetes, such as elevated haemoglobin A1c, fasting plasma glucose, or oral glucose tolerance test values, but who have not been formally diagnosed by a clinician and are unaware of their condition. In contrast, unrecognized diabetes is a broader construct that encompasses not only the absence of a formal diagnosis but also a lack of patient awareness,

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provider communication, or health system acknowledgment of abnormal glycemic status, even when laboratory evidence is documented in the medical record.

Selvin and colleagues emphasize that undiagnosed diabetes is fundamentally a measurement-dependent phenomenon, shaped by how diagnostic thresholds are applied, whether confirmatory testing is required, and how often individuals engage the health care system [7]. From this perspective, undiagnosed diabetes is not merely an individual-level failure to seek care but a systemic outcome influenced by screening practices, insurance coverage, and clinical workflows. Cowie and Casagrande similarly argue that unrecognized diabetes reflects persistent gaps in population-level detection, particularly among younger adults, racial and ethnic minorities, and individuals with limited access to primary care, underscoring its role as a marker of structural inequity rather than clinical rarity [8].

Together, this body of work clarifies that undiagnosed and unrecognized diabetes should not be viewed as transient or benign states preceding inevitable diagnosis. Rather, they represent a prolonged, clinically meaningful phase of disease during which hyperglycemia silently contributes to vascular damage, cardiometabolic risk, and downstream complications. This sustained invisibility, despite biochemical evidence of disease, justifies conceptualizing undiagnosed diabetes as a distinct burden within the broader diabetes continuum and supports the proposed framing of this population as Type 3 Diabetes.

Reframing the Undiagnosed Burden: Why "Type 3"?

The term Type 3 Diabetes has appeared in the literature in other contexts, most notably to describe Alzheimer's disease as a form of brain insulin resistance. Although the designation Type 3 has been used in the literature to describe alternative chronic disease frameworks, this manuscript adopts the term Type 3 Diabetes to denote the next sequential classification, intentionally labelling undiagnosed diabetes as a distinct and conceptually meaningful phase within the broader diabetes continuum. Here, the term is used intentionally differently, as a provocative and pragmatic construct to describe diabetes that is in plain sight yet outside formal diagnosis. This framing is not meant to replace existing classifications but to challenge complacency about under diagnosis and to emphasize that undiagnosed diabetes is not a marginal problem; it is a core component of the diabetes epidemic.

Labelling undiagnosed diabetes as Type 3 serves several purposes. First, it signals that undiagnosed disease is not merely a transitional state toward diagnosis but a distinct phase with measurable risk. Second, it underscores the systemic nature of the problem, implicating screening policies, access to care, health literacy, and structural inequities. Third, it provides a shared language for clinicians, researchers, and policymakers to discuss detection failures with the same seriousness as treatment gaps.

Importantly, estimates of undiagnosed diabetes vary by methodology. Studies using single laboratory measures (e.g., HbA1c or fasting plasma glucose) report higher prevalence than studies that require confirmatory testing, as recommended in clinical practice [9]. Nonetheless, even conservative estimates consistently show that millions of U.S. adults meet biochemical criteria for diabetes without awareness or diagnosis. The persistence of this gap, despite advances in diagnostics and therapeutics, suggests that under diagnosis is not simply a technical issue but a structural one [3].

Equity, Risk, and the Invisible Patient

The burden of undiagnosed diabetes is not evenly distributed. Higher rates are observed among individuals with limited access to primary care, those with lower socioeconomic status, and historically marginalized racial and ethnic groups. Younger and working-age adults, as well as those without regular health system engagement, are also more likely to remain undiagnosed. For these groups, Type 3 Diabetes often coexists with obesity, hypertension, and other cardiometabolic risk factors, thereby amplifying cumulative risk.

From a health equity lens, undiagnosed diabetes

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reflects missed prevention opportunities driven by SDOH, insurance instability, and inconsistent screening practices. Without a diagnosis, lifestyle counselling, pharmacologic intervention, and surveillance for complications are delayed. By the time diabetes is identified, individuals may already have advanced disease, reinforcing disparities in outcomes and costs.

What Should Clinicians and Health Systems Do Differently?

Reframing undiagnosed diabetes as Type 3requires recalibrating clinical and public health priorities. First, screening must be normalized and broadened. Current guidelines appropriately recommend risk-based screening; however, implementation remains uneven. Clinicians should adopt opportunistic screening in primary care, urgent care, emergency departments, and specialty clinics, particularly among patients with obesity, a family history of diabetes, or cardiometabolic comorbidities.

Second, clinicians must communicate risk more explicitly. Patients with prediabetes or borderline laboratory values should be counselled that they are on a continuum of disease risk, not a binary threshold. Clear messaging about the real and immediate health consequences of undiagnosed diabetes may improve engagement and follow-up.

Third, health systems should leverage data, technology, and team-based care. Electronic health records can flag patients who meet laboratory criteria for diabetes but lack a corresponding diagnosis. Community health workers, pharmacists, and nurses can support screening, education, and care linkage. Emerging applications of artificial intelligence and machine learning may further enhance risk stratification and early detection, particularly among high-risk populations. Liu and colleagues developed and validated an automated machine learning (AutoML) model to detect undiagnosed diabetes among U.S. adults using NHANES data. The AutoML approach demonstrated strong predictive performance, underscoring the real-world potential of AI tools to identify undiagnosed disease and enhance large-scale screening efforts [10]. Likewise, Hu and colleagues conducted a systematic review and meta-analysis of AI-based interventions in diabetes care, documenting AI's role in enhancing personalized management and clinical decision support. Their findings underscore AI's transformative role in tailoring diabetes care and improving outcomes [6]. Talbert and colleagues followed a similar approach, evaluating the performance of decision tree ensemble methods for predicting the onset of diabetes using the Framingham Heart Study Teaching Dataset and exploring sex-specific risk patterns relevant to AI-driven interventions. The findings underscored that machine learning approaches, particularly Random Forests, show promise for medium- and long-term diabetes risk prediction, thereby supporting early identification and intervention [11].

Recent advances in AI/ML show strong potential to improve both the detection and management of diabetes. Automated machine learning models have demonstrated high accuracy in identifying undiagnosed diabetes in nationally representative U.S. populations, underscoring their value as scalable screening tools. Evidence from systematic reviews indicates that AI-based interventions can support personalized care, enhance clinical decision-making, and improve patient outcomes across diverse clinical settings [6].

Finally, public health practitioners, clinicians, and professional organizations should advocate for additional funding to continue investigating this major concern and to promote policies that support routine screening, diagnostic testing coverage, and investment in community-based prevention programs. Addressing Type 3 Diabetes requires alignment between clinical practice and public health infrastructure.

LIMITATIONS

Despite its contributions, this work has several limitations that warrant consideration. First, estimates of undiagnosed diabetes rely on cross-sectional surveillance data and single-time laboratory measures, which may either underestimate or overestimate true prevalence; second,

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state-level analyses cannot fully capture within-state heterogeneity or individual clinical trajectories; and third, the proposed use of Type 3 Diabetes is a conceptual framework rather than a formally recognized diagnostic classification. Nonetheless, these limitations do not diminish the significance of the findings, as they underscore the persistent invisibility of a large at-risk population and reinforce the value of continued scholarly, clinical, and public health dialogue to advance early detection, equity-focused screening, and systems-level solutions. Overall, while the information is presented as commentary or to illustrate the seriousness of the topic, it is also relevant and advisable to use these findings to inform prescriptive actions, such as developing policies, supporting our clinicians, and applying these findings to effect change.

A Call to Name, Measure, and Act

The ongoing problem of undiagnosed diabetes in the United States requires sustained attention beyond modest gains in screening. By framing undiagnosed diabetes as Type 3 Diabetes, we aim to shift the conversation from passive under detection to shared responsibility across clinical and public health systems. This term is a conceptual tool rather than a formal disease classification. As the diabetes epidemic evolves alongside rising obesity, population aging, and widening inequities, failing to address the undiagnosed burden could undermine progress in prevention and control. Clinicians, researchers, and policymakers should treat undiagnosed diabetes as a central challenge rather than a peripheral statistic. Explicitly naming and measuring this burden could catalyze more consistent screening, earlier intervention, and improved outcomes for populations currently left unseen. This is not only a responsibility of public health practitioners; all parties are essential to addressing this issue. Therefore, it is important to include physicians, practitioners, clinical-level actions, and policy-level interventions, as they must operate in unison to achieve the task.

In conclusion, reconceptualising the diabetes epidemic beyond the traditional Type 1/Type 2 dichotomy is critical to addressing the vast undiagnosed burden that persists globally. This manuscript underscores that a significant proportion of individuals experience hyperglycemia that does not fit neatly into conventional categories, leading to delayed diagnosis, suboptimal management, and preventable complications. By integrating evidence on the epidemiology of atypical and undiagnosed forms of diabetes, assessing the limitations of current screening paradigms, and highlighting the socio-structural determinants that drive disparities in detection and care, it offers a robust framework for research and clinical practice. Moving forward, refining diagnostic criteria to capture the full spectrum of glucose dysregulation and using stratified risk algorithms and population-tailored screening will be essential for reducing morbidity and health inequities [12] (e.g., reports from the International Diabetes Federation and analyses of global screening gaps). These implications will help embrace this expanded view, not only sharpening our scientific understanding but also catalyzing more inclusive and effective interventions that can truly bend the curve of the diabetes pandemic.

CONFLICT OF INTEREST

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