

UNDIAGNOSED DIABETES IN ADULTS IN THE USA AND BULGARIA: PREVALENCE AND TRENDS

DIABETES NÃO DIAGNOSTICADO EM ADULTOS NOS EUA E NA BULGÁRIA: PREVALÊNCIA E TENDÊNCIAS

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Abstract

This report presents a comparative analysis of the prevalence of diabetes in the United States and Bulgaria from 2001 to 2025, focusing on differences in diagnostic criteria, methodology, and epidemiological trends. The data show a significant increase in the prevalence of total and diagnosed diabetes in the U.S., while undiagnosed cases remain relatively stable. In Bulgaria, a steady increase in prevalence is also reported, particularly among older age groups, with approximately 16.5% of the population living with diabetes. Differences in the diagnostic criteria used (ADA vs. WHO) make direct comparisons between the countries difficult. The need to establish a national epidemiological surveillance system modeled after NHANES (U.S.) is emphasized in order to more accurately monitor and prevent the disease.

Keywords: Diabetes. Epidemiology. NHANES. ADA. Bulgaria. U.S.

Resumo

O relatório apresenta uma análise comparativa da prevalência da diabetes nos Estados Unidos e na Bulgária no período de 2001 a 2025, com ênfase nas diferenças nos critérios de diagnóstico, na metodologia e nas tendências epidemiológicas. Os dados mostram um aumento significativo na incidência de diabetes geral e diagnosticada nos EUA, enquanto os casos não diagnosticados permanecem relativamente estáveis. Na Bulgária, também se observa um aumento constante da incidência, especialmente entre os grupos mais idosos, com aproximadamente 16,5% da população vivendo com diabetes. As diferenças nos critérios diagnósticos utilizados (ADA versus OMS) dificultam a comparação direta entre os países. Destaca-se a necessidade de criar um sistema nacional de vigilância epidemiológica seguindo o modelo do NHANES (EUA), com o objetivo de acompanhar e prevenir a doença com maior precisão.

Palavras-chave: Diabetes. Epidemiologia. NHANES. ADA. Bulgária. EUA.



1 INTRODUCTION

Diabetes is a major risk factor for the development of cardiovascular diseases, microvascular complications, and premature mortality. In 2020, diabetes mellitus ranked among the leading causes of death in the United States (USA), holding the eighth position and being associated with over 100,000 deaths annually (AHMAD, F. B., & ANDERSON, R. N., 2021). In Bulgaria and most European Union (EU) countries, diabetes is establishing itself as a significant medical and socio-economic problem. According to the International Diabetes Federation, **reported for 2021**, approximately 9.9% of the adult population in Bulgaria lives with diabetes, with **around 519,300 cases** (IDF Europe, 2025). The trend of the disease shows a gradual increase in the number of affected individuals. Approximately **50%** of affected individuals remain undiagnosed, as presented and compared in Table 1. Observations show a **lower absolute percentage - 14% - than some estimates in the USA**. There is a **steady upward trend**, parallel to changes in demographic structure, dietary habits, and the globalization of risk factors for type 2 diabetes.

Table 1

Comparison USA and Bulgaria - Trends

Indicator	USA (NHANES 1999 - 2023)	Bulgaria (contemporary estimates)
Total Diabetes	Increase from 9.7% to 14.3%	7.4-9.8% (various estimates)
Diagnosed Diabetes	Increase from 5.9% to 10.1%	Data not as clearly distinguished
Undiagnosed Diabetes	Stable (3.7-4.8%)	Few systematic data
Trends	Clear growth over the last 20 years, especially diagnoses	Gradual increase; need for standardized data

Note: Bulgarian data are based on clinical registries or specific studies with variations in methodology, which makes direct comparison with standardized NHANES estimates difficult. Some estimates for Bulgaria are derived from the National Diabetes Atlas and national registries, which typically do not provide trends as detailed as NHANES (Krastev, E., & Tcharaktchiev, D., 2023).

In the United States, the age-adjusted prevalence of total and diagnosed diabetes increased significantly during the period 2001-2023. Undiagnosed cases maintained relatively stable positions.

For Bulgaria, available estimates show an **increase in diabetes**, but there is a need for more standardized, national studies for precise comparison with the USA. In various Bulgarian studies, the **diagnostic criteria of the WHO and the American**

Diabetes Association (ADA) vary, which affects estimates for prediabetes and diabetes. Examples from independent studies show a diabetes prevalence of **around 16.55%** and **prediabetes of 20.6%** in certain age groups using WHO and World Diabetes Federation (IDF) criteria (IDF, 2024; ARNOLD, A., 2017).

When comparing data between the USA and Bulgaria, the following should be considered:

- **Methodological differences** - Bulgarian data are often based on separate administrative registries, studies, or screenings; the **National Health and Nutrition Examination Survey (NHANES)**, part of the **National Center for Health Statistics (NCHS)** of the **Centers for Disease Control and Prevention (CDC)**, is a nationally representative survey under strict standards. Percentages for diagnosed, undiagnosed, and total diabetes are age-adjusted by direct standardization to the **US Census 2000** (Gwira, J.A., 2024).
- **Diagnostic criteria:** ADA versus WHO criteria lead to different prevalence rates of prediabetes. Existing epidemiological studies in the country, however, differ in the diagnostic criteria used, with some applying the recommendations of the World Health Organization (WHO), and others those of the American Diabetes Association (ADA). This leads to differences in estimates and makes direct comparison of results between different studies and countries difficult. A standardized national system for epidemiological surveillance, modeled on NHANES (USA), is needed to provide comparable data and to assess trends in the prevalence of diabetes and prediabetes.
- **Insufficiency of laboratory data for prediabetes and undiagnosed diabetes** in many Bulgarian databases.

Prevalence rates in the USA are higher in absolute terms, but a **clinically significant increase** is also observed in Bulgaria, which is reinforced by demographic and risk factors such as obesity and an aging population.

The disease has a significant economic burden on the healthcare system. Total annual costs, including medical and socio-economic losses, exceed 400 billion US dollars in the USA, and in Bulgaria, they exceed 1 billion BGN annually (DALL, T. M., et al., & HOGAN, P. F., 2019). The disease is among the leading causes of disability, vision

loss, kidney failure, and amputations due to diabetic angiopathy. A significant portion of these complications can be prevented with early diagnosis and effective glycemic control.

An accurate assessment of the prevalence and structure of diabetes is presented in Table 2, and is of particular importance for evaluating public health efforts and developing interventions aimed at primary and secondary prevention.

Table 2

Prevalence of Diabetes Mellitus and Impaired Glucose Tolerance in Bulgaria in 2024 (Journal Endocrinologia volume XXIX, number 2/2024)

Groups	Percentage
Healthy	83.44%
Diabetes - Total	16.55%
Diagnosed Diabetes	8.22%
Newly Diagnosed Diabetes	8.33%
Impaired Glucose Tolerance	8.2%
Impaired Fasting Glycemia	12.4%

Similar to observations in the USA, Bulgaria also reports a growing proportion of individuals with undiagnosed diabetes and prediabetic conditions. Screening studies in 2024-2025 show that **over 20%** of the population has laboratory indicators corresponding to prediabetes, and **10% of young adults** aged 18 to 44 show impairments in glycemic control, as presented in Table 3.

Table 3

Impaired Glycemic Control in Bulgaria for 2024 (Journal Endocrinologia volume XXIX, number 2/2024)

	Gender	20-44 yrs.	45-59 yrs.	60-79 yrs.
For the country	Women	11.1%	25.0%	63.9%
	Men	24.4%	31.7%	43.9%
	Total	18.2%	28.6%	53.2%

In epidemiological studies conducted in Bulgaria, it is reported that **diabetes has a prevalence of about 16.55%** among the adult population, with approximately **8.22% being diagnosed and 8.33% being undiagnosed cases**, and **prediabetes reaches 20.6%**, including impaired fasting glycemia (Table 4) and impaired glucose tolerance (BDE, 2024). Furthermore, the prevalence of the disease is significantly higher in men compared to women and increases with age (BDE, 2024).

Table 4

Impaired Fasting Glycemia in Bulgaria, 2024 (Journal Endocrinologia volume XXIX, number 2/2024)

	Gender	20-44 yrs.	45-59 yrs.	60-79 yrs.
For the country	Women	13.8%	37.9%	48.3%
	Men	22.4%	41.4%	36.2%
	Total	18.1%	39.7%	42.2%

Analyses from 2024-2025 show (Table 5) that **approximately 482,000 - 770,000 Bulgarians live with diabetes**, which is 16.5% of the population. Some of them remain undiagnosed. This reflects the growing epidemiological burden in the country and represents a significant increase compared to earlier studies.

Table 5

National Estimates of the Prevalence of Diabetes, Undiagnosed Diabetes, and Prediabetes in Adults (≥18 years) in the USA and Bulgaria, 2001-2025

Indicator	Definition / Methodology	USA (NHANES 2001-2023, CDC/NCHS)	Bulgaria (nat. data, IDF, IMPACT studies 2020-2025)
Diabetes - total prevalence	HbA1c ≥ 6.5% and/or FPG ≥ 126 mg/dL, with or without self-reported diagnosis	14.3% of adults over 18 yrs. (2021-2023, age-adjusted); increase from 9.7% (2001)	7.4 - 9.9% of adults between 20-79 yrs.; upward trend in 2006-2024
Diagnosed diabetes	Self-reported diagnosis from a doctor or specialist	10.1% of adults for the period 2021-2023	Approximately 480,000-770,000 people, around 7-8%; registered according to NHIF and BDA data
Undiagnosed diabetes	No self-reported diagnosis, but HbA1c ≥ 6.5% or FPG ≥ 126 mg/dL	3.7 - 4.2% (stable trend since 2001)	About 50% of people with diabetes are unaware of their diagnosis
Prediabetes	HbA1c 5.7-6.4% or FPG 100-125 mg/dL (without diabetes)	38% of adults or 97.6 million people; awareness < 20%	20-22% of the population; 10% of young people aged 18-44 yrs.
Trends (2001-2023)	Joinpoint analysis with up to 3 trend changes; age-adjusted estimates	Linear growth of total and diagnosed diabetes; stable undiagnosed proportion	Sustained increase in diabetes cases after 2010; need for standardized screening
Methodological notes	NHANES: multi-stage design, weights, FPG adjustments; pregnant women and missing values excluded	Same criteria applied for analyses	Bulgaria: different diagnostic criteria (WHO vs ADA), lack of a unified registry
Conclusions	Strong increase in diagnosed diabetes, stable undiagnosed, low awareness of prediabetes	Increasing prevalence; half of those affected are unaware; need for a	

		national NHANES-like model	
CDC (2025); Borissova et al., 2024; WHO Europe (2024)			

Main trends in the USA and overall prevalence. Analysis of age-adjusted trends from **1999-2000 to 2023** shows:

- **Total diabetes:** age-adjusted prevalence increased from 9.7% in 1999-2000 to **14.3%** by August 2023.
- **Diagnosed diabetes:** from **5.9%** to **10.1%** for the same period.
- **Undiagnosed diabetes:** no statistically significant changes were observed over these periods, with absolute values remaining stable in recent years (GWIRA, J. A., & GU, Q. 2024).

The data indicate that **diagnosed diabetes is the main driver of the increase in overall prevalence**, while the proportion of undiagnosed cases remains relatively stable and constitutes a significant share of the total number of people with diabetes (GWIRA, J. A., & GU, Q. 2024; OASH/ODPHP, 2020).

1.1 Development over the last 20 years

- In **2001-2004**, age-adjusted estimates showed a total diabetes prevalence of around **10.3-11.6%**, with a gradual increase to **14.8-15.8%** in **2017-2023**.
- This growth is statistically significant, especially for total and diagnosed diabetes, while the **prevalence in adults with undiagnosed diabetes** has remained **more stable** (TERRY, A.L., et al., 2024).

Demographic and Risk Factors - Observations from NHANES (2021-2023) indicate that:

- The total prevalence of diabetes increases with age and with rising body weight.
- The prevalence of total and diagnosed diabetes decreases with a higher level of education (GWIRA, J.A., 2024).

These patterns reflect the interplay of demographic, socio-economic, and biomedical determinants in diabetes trends.

Data for Bulgaria and contemporary trends. Available data on diabetes in Bulgaria show:

- According to the analysis of national registries and outpatient records for **2018**, the total prevalence of diabetes is about **9.8%** of the total population, which **exceeds** the average European values of **6.2%** for the same period (DPDDEORRBP, 2023).
- Publications for the period 2006-2024 show a sustained increase in diabetes, especially in older age groups from 60-79 years, where the prevalence reaches almost **30%** in some estimated subgroups (BORISSOVA, A., 2024).
- The World Bank database for 2024 provides information on diabetes with a total prevalence of **7.4%** among individuals aged 20-79 years on average for Bulgaria, although this estimate varies depending on the source and methods used.

According to the **International Diabetes Federation (IDF)**, as of 2024-2025, about **11.1% of the world's adult population (20-79 years)** live with diabetes, which equates to **1 in 9 people**, with projections for future growth by 2050. It also reports that a large proportion of people with diabetes **are not diagnosed or treated**, and as a share of global estimates, it notes that **over 40%** of those affected are unaware of their condition (IDF, 2025).

Prevention, health promotion, and the role of the nurse in the control of undiagnosed diabetes in Bulgaria and the USA.

According to the Centers for Disease Control and Prevention (CDC, 2025), over 30% of type 2 diabetes cases can be prevented with timely intervention, weight control, healthy eating, and physical activity. The National Diabetes Prevention Program (National DPP) in the USA is a multidisciplinary model that includes certified nurses, dietitians, trainers, and consultants. This program has been proven to reduce the risk of developing diabetes by up to 58% in high-risk individuals (CDC, 2025).

In Bulgaria, prevention is regulated by the Ministry of Health and the National Health Insurance Fund with the help of the National Program for the Prevention of Chronic Non-communicable Diseases (2014-2025). The scope of prevention remains limited, and systematic interventions applied for early identification and promotion of a healthy lifestyle are fragmented and unevenly applied at a regional level (BDE, 2024).

1.2 The role of the nurse in the prevention and control of diabetes.

For diabetes prevention, the nurse is a key intermediary between the patient, the general practitioner, and the multidisciplinary team. She actively participates in all three levels of prevention. Her role includes:

- **Screening and early detection** using measurements of blood glucose, BMI, waist circumference, and assessment of risk factors.
- **Educational and advisory activities**, which include: educating patients on glycemic self-monitoring, dietary regimen, physical activity, and prevention of complications.
- **Motivational counseling**: using strategies to support and encourage the patient towards self-control and lasting lifestyle changes.
- **Interprofessional coordination**: teamwork with endocrinologists, dietitians, and social workers for comprehensive care.

According to the *American Association of Diabetes Care & Education Specialist*, a nurse can obtain certification as a *Diabetes Care and Education Specialist (DCES)* - a professional role combining clinical competence with an educational and advisory function. In the USA, these specialists are leading participants in *Diabetes Self-Management Education (DSME)* programs, which have a proven positive effect on glycemic control, quality of life, and lower hospitalization rates (POWERS, M. A., et al., 2021; ADA, 2023).

In Bulgaria, the nurse's role is more limited due to the lack of an autonomous license for diabetes education and national standardized training programs. Over the last five years, there has been a development of initiatives for specialized training of nurses in diabetes care, coordinated by universities and professional organizations. The project "Nursing Care for Chronic Diseases" (MZ, 2023) aims to introduce an integrated model, similar to the American one shown in Table 6, where the nurse is an intermediary between the patient and the multidisciplinary team.

Table 6*Comparison of the nurse's role in the USA and Bulgaria*

Function	USA	Bulgaria
Level of autonomy	High – nurses (RN, NP, DCES) can independently perform assessment, education, and follow-up	Limited - they work mainly under medical supervision, without independent diagnosis or therapeutic decisions
Specialization	Certified Diabetes Care and Education Specialists (DCES); accreditation by ADCES	Specialization in endocrinology and diabetes care (modular or university form)
Educational role	Leading in DSME, National DPP, and telemedicine programs	Developing - includes health education in general practice and school campaigns
Prevention and promotion	Emphasis on community-based and school-based programs; use of digital tools	Predominantly campaigns through regional health inspectorates and MoH programs
Interprofessional collaboration	Highly structured in Primary Care Teams and Endocrine Centers	Partially realized - depends on the hospital structure

1.3 Strategic Priorities for Bulgaria

1. **Introduction of a national standard** (Technical Sheet) for "diabetes nurse," including training for clinical monitoring, counseling, and health promotion.
2. **Creation of educational programs** for patients and families, modeled on Diabetes Self-Management Education (DSME).
3. **Integration of nurses** into multidisciplinary teams, general practices, and Endocrinology departments.
4. **Digitalization and telemedicine** - integration of nurses into structures for remote monitoring and support of patients with diabetes, using mobile applications and real-time glycemic monitoring systems.

2 CONCLUSION

Many of the epidemiological studies conducted to date are based on single elevated values of glycated hemoglobin (HbA1c), fasting plasma glucose (FPG), or glucose 2 hours after an oral glucose tolerance test, which are used to determine undiagnosed diabetes. These approaches differ from clinical guidelines, according to which any deviation should be confirmed by a second measurement before making a final

diagnosis (ADA, 2021). The prevalence of undiagnosed diabetes, determined by such studies, overestimates the actual incidence of the disease (GEISS, L. S., & GREGG, E. W., 2018).

An accurate assessment of the prevalence of diabetes is essential for monitoring the effectiveness of public health policies and for developing targeted prevention and control strategies. Available data from reference sources present a significant increase in the incidence of diabetes in the USA over the past two decades, as well as a high proportion of individuals with an undiagnosed disease (MENKE, A., & COWIE, C. C., 2015; CDC, *National Diabetes Statistics Report*, 2020). Similar trends are observed in Bulgaria, with a different methodological basis and diagnostic criteria (WHO versus ADA). The need to introduce a national system for epidemiological surveillance, comparable in scope and methodology to NHANES (USA), is emphasized.

The nurse holds a key position in the system for the prevention and management of diabetes - from primary health education and screening to the complex care of the chronically ill patient. She is crucial for the early detection of risk factors, in educating patients about self-control, and in supporting adherence to the therapeutic regimen and a healthy lifestyle.

In the United States, the role of the nurse is clearly defined, institutionalized, and integrated into national programs such as **Diabetes Self-Management Education (DSME)** and the **National Diabetes Prevention Program (DPP)**. In Bulgaria, its development is gradual. The absence of specialized certification and standardized training protocols limits the potential of the nursing profession in the field of chronic diseases.

Strengthening the nursing role in Bulgaria with the help of regulatory support, training, and digital solutions will lead to more effective screening, early intervention, and a sustainable improvement in glycemic control. Thus, the nurse can become a central coordinator of diabetes care, contributing to the reduction of complications, an increase in the quality of life, and the optimization of public health resources.

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