Consequences of Insufficient Physical Activity:
A Comparative Analysis of Poland and Europe

Artur Białkowski
Piotr Soszyński
Dariusz Stencel
Urszula Religioni

Corresponding Author: Artur Białkowski, e-mail: artur.bialkowski@medicover.pl
Financial support: None declared
Conflict of interest: None declared

Physical activity remains one of the most important factors affecting the well-being, health, and quality of life of individuals and entire populations. Unfortunately, the level of physical activity in many social groups is still insufficient according to the recommendations of the World Health Organization (WHO) and other international and national scientific societies. This paper presents the most important aspects related to the impact of physical activity on health, including lifestyle diseases, such as cardiovascular diseases, diabetes or obesity, mental health, and sleep, and overall mortality. We aimed to determine the level of physical activity in the Polish population compared with that of other European countries and in connection with guidelines and recommendations developed by various scientific societies. The most frequently reported obstacles to physical activity were also identified, and possible ways to solve these problems were discussed. Brief reference was also made to the recent COVID-19 pandemic, which had a significant impact on physical activity. We concluded that the current situation is not optimal, both in terms of implementing recommendations and guidelines for physical activity among people who are healthy and who have disease and identifying and overcoming existing barriers and limitations. We aimed to review recent trends in physical activity in Poland and the rest of Europe and discusses the potential impact of lack of physical activity on health.

Keywords: Sedentary Behavior • Life Style • Primary Prevention • Poland

Full-text PDF: https://www.medscimonit.com/abstract/index/idArt/942552
Physical activity is an inseparable feature of human life. This paper refers to physical activity as the work of skeletal muscles accompanied by functional changes in the body or energy expenditure [1,2]. According to the Dictionary of the Sport and Exercise Sciences, physical activity is a movement of the human body that results in energy expenditure at a higher level than the resting metabolic rate [3]. Other sources define physical activity as the amount of movement that is necessary for human health and development [4]. Physical activity understood in this way includes almost all types of sport and dance forms treated as recreation and professional sport, as well as physical activity related to everyday household and professional activities.

Physical activity undertaken at an appropriate level of intensity can therefore be an important factor in the broadly understood concept of “health prevention” and a method of non-pharmacological treatment, enabling reduction of disease-specific morbidity, especially regarding lifestyle diseases, reduction of all-cause mortality, incidence of mental disorders, addictions, and destructive behavior, as well as improved quality of life [4-8]. There is growing evidence that sport and physical activity improves work performance, job satisfaction, and productivity. The European Union (EU) [9] and US Centers for Disease Control (CDC) [10,11] encourage employers to promote and support sport and physical activity to improve employee health and save money. The CDC suggests that worksite wellness programs, which comprise various forms of physical activity, can increase employee productivity, reduce absenteeism, increase employee morale, and help in attracting and keeping high-quality employees. Recent evidence indicates that workplace nutrition and physical activity interventions can significantly positively affect absenteeism, work performance, workability, and productivity [12,13]. The beneficial effect of physical activity on absenteeism seems particularly important, as it directly improves work performance. There are several studies supporting this observation; however, the work of Losina et al [14] is especially valuable, as participants’ activity was recorded on an accelerometer rather than self-reported, providing strong objective evidence. It has been found that, compared with employees meeting the CDC activity guidelines (>150 min/week), those with moderate activity (75-149 min/week) had a 2.4-fold higher, and those in the low activity group had a 3.5-fold higher rate of illness-related absenteeism. Physical activity also improves life satisfaction and happiness [15]. Polish studies have also shown that engaging in activity in youth (before the age of 35) can be associated with improved physical activity, physical fitness, and general health in older age (55-64 years). Additionally, physical activity increases self-esteem and promotes contact with people [16].

Physical activity can also contribute to reducing the economic burden on society, especially that of the healthcare system related to the treatment of chronic somatic and mental diseases. The 2022 WHO Physical Activity Report states that the global cost of treating new cases of preventable non-communicable diseases will reach nearly $300 billion by 2030, or approximately $27 billion annually [17].

We aimed to present the results of research on the impact of physical activity on selected areas of health and the degree of physical activity of the Polish population, to indicate barriers and obstacles in undertaking this activity, and to present possibilities of solving this problem.

Impact of Physical Activity on Healthcare System

Health Risk and Lifestyle Diseases

Research results confirm that regular physical activity helps to prevent diabetes, metabolic syndrome, cardiovascular diseases, hypertension, obesity, osteoporosis, cerebrovascular diseases, ischemic heart disease, and some types of cancer [1,18]. Attention was also drawn to the positive impact of physical activity on the elderly, which is conducive to so-called “successful aging” [19]. Additional benefits of increasing physical activity include increasing muscle and bone mass, making it easier to maintain a long-term diet regime, and improving strength and fitness [1].

On the other hand, physical inactivity is associated with the development of many diseases and premature death and is a significant burden on healthcare systems. According to estimates, the total cost of physical inactivity globally would be approximately $520 billion over an 11-year period (2020-2030) if global levels of physical activity are not increased [20,21]. A 2022 WHO report indicated that if countries do not take urgent action to encourage more physical activity, nearly 500 million people will develop heart disease, obesity, diabetes, or other non-communicable diseases related to physical inactivity between 2020 and 2030, at a cost of $27 billion annually [17].

A 2016 WHO analysis shows that physical inactivity is an additional risk factor for ischemic heart disease in 6% of patients, type 2 diabetes in 7% of patients, breast cancer in 10% of patients, and colorectal cancer in 10% of patients, and increasing physical activity by 25% globally would reduce the number of deaths by over 1.3 million per year [17,22].

Cardiovascular Diseases

Since the second half of the 20th century, diseases of the cardiovascular system have been the main cause of morbidity
and mortality in Poland, Europe, and worldwide. The results of the analysis of the National Institute of Public Health-National Institute of Hygiene (NIPH-NIH), however, indicate that the rate of mortality reduction in Poland was lower than that in the Czech Republic or Sweden, for example, and finally amounted to 165.1 per 100,000 in men and 45.9 per 100,000 in women. For both sexes, these rates were higher than in Sweden (2.7 times higher for men and 2.2 times higher for women) and the Czech Republic (1.3 times and 1.1 times, respectively), and compared with Sweden, they were still higher than the mortality rates recorded in 1999 [16].

These observations are also confirmed by data regarding physical activity in EU countries published by the Organisation for Economic Cooperation and Development [23]. In some countries, the level of participation in sports and exercise changed considerably between 2017 and 2022. In 4 EU countries, the percentage of people declaring that they never exercise or play sport decreased considerably: Malta (-25 percentage points, currently 31%), Latvia (-23, 33%), Estonia (-18, 30%), Croatia (-16, 40%), and Czech Republic (-15, 26%). Unfortunately, Poland is one of the countries where such percentage has increased most notably (+9, 5%), together with Hungary (+6, 59%) and Portugal (+5, 73%). In addition, 8 countries with the highest percentage of people never exercising or playing sports also includes Poland (65%), Portugal (73%), and Greece (68%).

Several global organizations, such as the WHO, European Society of Cardiology, American College of Cardiology/American Heart Association, and American College of Sports Medicine, have developed detailed recommendations regarding physical activity as a factor preventing cardiovascular diseases. These recommendations vary in type, intensity, frequency, and duration of exercise, but generally recommend at least 150 min of moderate or 75 min of vigorous aerobic exercise per week [24-27].

Regular moderate physical activity (approximately 30 min/day) has a very beneficial effect on the circulatory system by lowering blood pressure, reducing blood coagulability, improving fibrinolytic capacity, and stimulating vascular remodelling. The results of the INTERHEART study indicate that physical activity in combination with a healthy diet, appropriate body weight, and not smoking can prevent about 80% of deaths or morbidity from cardiovascular diseases [22,28].

**Hypertension**

Hypertension is one of the most common diseases of the cardiovascular system; on the other hand, it is one of the main modifiable risk factors. According to the authors of the 2011 NATPOL study, the incidence of hypertension increases with age, from 10% in the 18-39 year age group to 65% in the 60-70 year age group. Overall, the results of the NATPOL study show that one-third of the Polish population (33%) has undiagnosed hypertension. In total, 9% of residents have been diagnosed but not treated, 36% have been treated ineffectively, and 25% have been successfully treated. If these trends continue, the number of patients with hypertension will increase by 50% by 2035, if the current criteria for diagnosis are in use. According to the data of the National Health Fund for 2018, almost 10 million adult Poles were diagnosed with hypertension, accounting for 31.5% of the country’s population [29].

The basis of hypertension prevention and treatment is education, lifestyle modification (normalizing body weight, modifying diet, limiting consumption of table salt and alcohol, stopping smoking, and increasing physical activity to 5-7 times a week for at least 20-30 min), and early diagnosis [30].

**Diabetes**

Diabetes has long been recognized as a lifestyle disease. According to WHO data, in 2014, over 420 million people worldwide had diabetes, and the incidence of this disease almost doubled since 1980 (from 4.7% to 8.5%) [17]. In 2019, diabetes was the cause of 1.5 million deaths worldwide, half of which were deaths in people under the age of 70 years [31].

According to the data of the National Health Fund in Poland, in 2018, 2.9 million adults (9.1% of the population) had diabetes, and estimates predict that this number will increase to over 4.2 million in 2030. Importantly, diabetes is a significant burden for the healthcare system – in 2017, the costs of diagnosing and treating diabetes alone amounted to PLN 2.8 billion, and comorbidities more than PLN 3.2 billion [31].

The 2019 European Society of Cardiology diabetes guidelines emphasize the positive impact of physical activity on glycemic control and the number of cardiovascular events. It generally recommends exercise 2 to 3 times or even 3 to 5 times a week; however, the duration (from 150 to 300 min), intensity, and type of exercise must depend on the patient’s clinical situation. A similar position is expressed by the authors of the 2019 American College of Cardiology/American Heart Association guidelines. This confirms that the indication of exercise as part of therapy requires the detailed knowledge of healthcare professionals and careful counseling and recommendations for patients. Formulating recommendations regarding physical activity for patients with diabetes is somewhat facilitated by the fact that positive effects are visible after both aerobic and resistance exercise.

**Obesity and Overweight**

According to the WHO definition, obesity is an abnormal and excessive accumulation of adipose tissue in the human body,
which poses a health risk. In most cases (90%), it is the result of excessive consumption and a positive energy balance, although additional factors contributing to overweight and obesity, such as environmental, social, behavioral, mental, biological, and genetic, are significant [32].

The prevalence of overweight and obesity has been steadily increasing since the 1970s, and it is estimated that in 2016, 2 billion people worldwide had overweight and 650 million had obesity. In Poland, about 8 million people have obesity. Physical activity is conducted in parallel with dietary and behavior modification as part of lifestyle interventions. In general, engaging in physical activity for 150 to 420 min per week is recommended, which is equivalent to 30 to 60 min per day. The intensity of the effort must be adapted to the patients’ capabilities, general health, and additional diseases, so as not to expose them to injury or other complications. It should be assumed that any form of activity is appropriate if the patient agrees to it [33].

In recent years, a number of studies have assessed the impact of physical activity on the incidence of cancer (breast, lung, prostate, and colorectal cancer). The results of these studies clearly show the value of physical activity in general cancer prevention. In people practicing sports 3 times a week and leading a healthy lifestyle, the incidence of cancer decreased by as much as one-third, compared with the group of people without physical activity.

Impact of Physical Activity on Mental State and Sleep

According to the WHO, mental health is a state of well-being in which a person realizes his or her abilities and is able to cope with various life situations, participate in social life, and work productively [17].

Mental illness has become a major health concern worldwide, especially during the COVID-19 pandemic. In 2019, it is estimated that approximately 12% of the global population had various mental illnesses, which was associated with a significant burden on healthcare systems, translating into approximately 5% of disability-adjusted life years lost [34]. Furthermore, mental health disorders increase the incidence of comorbid physical illnesses, resulting in these patients living on average 15 to 20 years less than the general population. Risk factors for the development of comorbidities, including lifestyle diseases, include unhealthy lifestyle, unhealthy eating habits, sleep disorders, and low levels of physical activity associated with long periods of a sedentary lifestyle [35-38].

A meta-analysis of 49 prospective studies involving over 260,000 participants showed that people with higher levels of physical activity are less likely to develop depression, regardless of age group, sex, and geographic region, after considering potential confounding factors such as body weight, smoking, and the presence of comorbidities [39].

Physical activity programs in people with depression contribute to the reduction of body weight, waist circumference, body mass index, and amount of total body fat. In people with schizophrenia, counseling on lifestyle changes, including physical activity, was found to be the best way to reduce body weight, more effective than psychoeducation. The beneficial prophylactic effect of cardiovascular events, with favorable changes in the lipid profile, is also not to be underestimated. There are also beneficial effects of physical activity for people with anxiety disorders, post-traumatic stress disorder, bipolar disorder, and attention deficit hyperactivity disorder [34]. The European Psychiatric Association and many other national psychiatric societies have developed recommendations regarding physical activity for patients with depression and schizophrenia [40-42].

Good quality sleep is an integral part of physical and mental health. Physical activity is one of the factors affecting the amount and quality of sleep. Studies on the relationship between physical activity and sleep have shown that people who regularly engage in physical activity and spend little time in a sitting position are less likely to experience sleep problems [43].

Impact of Physical Activity on Overall Mortality

Strong scientific evidence shows that exercise reduces the risk of premature death from causes such as cardiovascular disease and some cancers. Few lifestyle choices have as much impact on preventing premature mortality as physical activity. It is estimated that people who are active for about 7 h per week have a 40% lower risk of premature death than those who are active for less than 30 min per week.

The latest meta-analyses of several dozen epidemiological studies indicate that systematic physical exercise reduces mortality caused by cardiovascular diseases by about 30% to 50% and the risk of overall mortality by about 30% [1]. For example, it was estimated that a 10% increase in physical activity levels globally would have avoided more than 500,000 deaths in 2008 [44].

Research shows that complete physical inactivity should be avoided in the first place. Even a small amount of exercise significantly reduces the risk of premature death. The clearest difference can be seen between those who are inactive (less
Table 1. Summary of physical activity levels recommended by the World Health Organization (modified from [17]).

<table>
<thead>
<tr>
<th>Population</th>
<th>Recommended level of physical activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnant and postpartum women</td>
<td>150 min per week</td>
</tr>
<tr>
<td>Adults and older adults</td>
<td>150-300 min per week</td>
</tr>
<tr>
<td>Children and adolescents</td>
<td>60 min per day</td>
</tr>
<tr>
<td>Adults</td>
<td>Muscle strengthening activities at least 2 days a week</td>
</tr>
<tr>
<td>Older adults</td>
<td>Multicomponent activities for balance and strength at least 3 days a week</td>
</tr>
<tr>
<td>Everyone who can</td>
<td>More than 300 min per week</td>
</tr>
</tbody>
</table>

than 30 min of exercise per week) and those who are low in activity (90 min of exercise per week).

**Physical Activity Recommendations**

In 2020, the WHO published recommendations regarding physical activity depending on age group and health status, including separate recommendations for people with chronic diseases. Table 1 present age-adjusted recommendations.

In its recommendations, the WHO states that muscles are strengthened by performing exercises of moderate or greater intensity, engaging all major muscles, on 2 or more days a week. Varied, multi-component physical activity, emphasizing functional balance and strength training of moderate intensity or higher intensity, should be performed 3 or more days per week. Moderate-intensity aerobic physical activity should be increased to more than 300 min per week, or vigorous-intensity aerobic physical activity for more than 150 min per week, or a combination of moderate-intensity and vigorous-intensity aerobic physical activity throughout the week [17].

Young people should have at least 60 min of moderate-intensity physical activity daily to improve cardiorespiratory fitness, maintain muscle strength, maintain bone health, improve cardiovascular function, improve metabolism, and reduce symptoms of anxiety and depression. People between the ages of 18 and 64 years should undertake aerobic physical activity related to mobility (eg, cycling and walking), work, housework, play, sports, or planned exercise resulting from everyday family and social activities of moderate intensity for at least 150 min per week or at least 75 min of vigorous intensity. This is the equivalent of moderate activity 5 days a week for 30 min or vigorous activity 3 times a week for 25 min [1].

The 2016 recommendations of the Polish Society of Cardiology correspond to the above recommendations of the WHO and the recommendations of the European Society of Cardiology, recommending physical activity with a frequency of 3 to 5 training sessions per week, preferably daily. It is recommended that you undertake moderate-intensity exercise for more than 30 min a day, 5 days a week (equivalent to 150 min a week), vigorous exercise for 15 min a day, 5 days a week (75 min a week), or a combination of both types of training lasting at least 10 min [45].

Also, the Polish Society of Sports Medicine has developed detailed recommendations for physical activity for adults and the elderly based on the recommendations of the European Society of Cardiology, American College of Sports Medicine, and American Heart Association [46].

Exercise intensity is determined by percentage of maximum oxygen uptake, ventilation threshold, or lactate threshold. Due to the need to perform special tests, in practice, the heart rate (HR) is most often used, where the formula HRmax=220–age is used to calculate the maximum heart rate.

**Physical Activity in Poland**

Recently, the Sport for All policy was initiated in Poland, the principles of which were set out in the documents Strategy for the Development of Sport in Poland Until 2015 [47] and the Sport Development Program 2020 [48], developed by the Ministry of Sport and Tourism. The Strategy for the Development of Sport in Poland Until 2015 defines 3 main priorities: (1) promotion of sport addressed to all people, (2) development of professional sports activities, and (3) development of a sports and recreation infrastructure. In turn, the main objective of the draft Sports Development Program 2020 is to create conditions for the development of sports and to promote healthy physical activity by creating conditions for and enabling physical activity at every stage of life. Its principles are as follows: using sport to build social capital, improving the organizational and legal conditions for the development of sport, increasing the availability of qualified human resources, and using the potential of sport at the competitive level to popularize physical activity in general and/or promote Poland in the international arena. The Polish Ministry of Health has also created the National Health Program for the years 2007-2015 [49], with objectives...
including increasing the physical activity of society, supporting the physical development and health of children and youth, preventing the most common health and social problems, and creating conditions for active life of people with disabilities. In its report, the WHO indicated that most initiatives affecting physical activity were undertaken in the areas of sport, education and monitoring; unfortunately, no action has been taken in the area of general health care or the organization of public transport. The objective of the National Health Program 2021-2025 is to increase the number of healthy years lived and reduce the burden of non-communicable diseases by reducing the main risk factors (smoking, alcohol consumption, unhealthy diet, and inadequate physical activity) and inequalities in the area of health by preventing and treating overweight, obesity, and mental disorders. The measures of program implementation are indicators of participation in physical activity programs depending on age and sex.

According to the WHO 2010 Global Health Observatory report, 79.5% of the adult population (aged over 18 years) in Poland met the WHO recommended levels of physical activity in all areas of life, including work, home activities, transport, and leisure time, with men being more active (85.6%) than women (74.0%) [50].

In Poland, research on physical activity has been conducted sporadically. Most data on this subject can be found in statistical yearbooks of the Central Statistical Office and reports prepared by government agencies, and recently more often by entities involved in the organization, promotion, and dissemination of physical activity. In the years 2003-2005 and 2013-2014, two editions of the WOBASZ study were conducted in Poland, which collected data on physical activity related to recreation and commuting to work/school in 19,000 adult Poles aged 20-74 years [51]. In 2013-2014, a decrease in physical activity was observed in all assessed domains, and the percentage of people undertaking physical activity for longer days decreased from 37.5% to 27.3% among men and from 32.7% to 28.3% among women. At the same time, a greater prevalence of sedentary work was demonstrated. In turn, the results of the 2011 NATPOL study show that 39% of respondents undertook regular physical activity. In the following years, this percentage increased even more. According to Metelski (2019) [52], 44% of men and 43% of women in Poland undertook the recommended amount physical activity. Unfortunately, as shown by the aforementioned Organisation for Economic Cooperation and Development data, this percentage significantly decreased in subsequent years, starting from 2017.

Since 2014, the Ministry of Sport and Tourism has been conducting cyclical surveys on physical activity among Poles. It was found that about 20% of the surveyed people aged 15 to 69 years meet the WHO recommendations regarding physical activity.

In 2020-2021, the National Health Test of Poles was conducted on the basis of surveys sent by internet users. There was an increase in the percentage of people undertaking physical activity (walking) every day, even for more than 2 h. In 2021, over 25% of the surveyed people devoted at least 2 h a day to practicing sports, and about 15% devoted 1 to 1.5 h [53].

There is no nationwide survey of transport-related physical activity in Poland. However, data on the intensity of walking and cycling from the 2014 National Physical Activity Survey showed the percentage of the population (aged over 15 years) using different modes of transport and transport-related physical activities (Table 2) [51].

The latest WHO report from 2021 indicates that active measures to increase physical activity concern children and adolescents (<5 to 17 years old), adults (18-64 years old), elderly people (>65 years old), pregnant and lactating women, and people with chronic diseases, excluding the elderly (>85 years old) and those in a worse general condition and with disabilities.

### Table 2. Percentage of the population (aged over 15 years) using different modes of transport and transport-related physical activities in Poland [51].

<table>
<thead>
<tr>
<th>Type of activity</th>
<th>At least once a week</th>
<th>For 5 days a week or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking (recreational)</td>
<td>51.5%</td>
<td>16.5%</td>
</tr>
<tr>
<td>Walking (as a means of transport)</td>
<td>52.0%</td>
<td>33.5%</td>
</tr>
<tr>
<td>Cycling (as a means of transport)</td>
<td>18.0%</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

**Obstacles in Undertaking Physical Activity**

In a 2019 systematic review, Spiteri et al. [54] analyzed barriers and obstacles to physical activity in the 50-64 and 65-70 age groups using the Theoretical Domain Framework assessing behavioral changes and indicated that the most frequently cited barriers in both groups related to “environmental context and resources”, followed by “social impact”. In the group of people aged 65-70 more often than in the younger group, “beliefs about their own abilities” were indicated. Other studies have indicated that people in the 65-70 age group also noted...
concerns about their own safety, health problems, and lack of appropriate guidance from health professionals [55,56]. In turn, barriers and obstacles indicated by people aged 50-64 years included social perception, working conditions, concerns about getting injured, and lack of time [57,58].

The report “Work. Health. Economy. Perspective 2022” published by Medicover identified that obstacles in undertaking physical activity are no time, unwillingness, no need, bad health condition, no company, no sports card, lack of self-confidence, no ideas for physical activity, lack of money, and type and time of work (manual work).

When discussing the obstacles to physical activity, we cannot fail to mention the COVID-19 pandemic. The pandemic and the related restrictions, such as the ban on leaving the place of residence, closure of recreational facilities, ban on entering the forests, and the introduction of remote work in many companies, have contributed to a radical reduction in the percentage of people undertaking physical activity. The results of an online survey [59] indicate that this affected 46% of respondents, while 43% of people stayed in a sitting position for longer (TV, computer, other electronic devices), and 34% significantly increased the number of calories consumed.

Possible Solutions

Recognizing the obstacles and barriers to physical activity in particular populations is a prerequisite for the official conduct of necessary activities, such as information and education campaigns, aimed at lifestyle changes [60].

The aforementioned systematic review [54] also indicated motivators, such as factors conducive to people aged 50-64 and 65-70 years undertaking physical activity. In both groups, the most frequently indicated motivators concerned “social influence”, followed by “goals set for oneself” in the 50-64 age group and the possibility of reinforcement in the 65-70 age group.

Motivators significant in both age groups included health reasons. In the younger group this was specified as weight control and stress level, and social reasons, in the older group it was defined as an opportunity for socialization. In the younger age group, setting an example for children, fear of getting sick, maintaining independence, and the need to take the dog for a walk were additionally indicated, and in the older age group the motivation was the desire to stay active.

Conclusions

Physical activity is an extremely important element of life, both when one is in a state of full health or disease. In our opinion, the current situation is not optimal in terms of implementing recommendations and guidelines for physical activity among people who are healthy or have disease and in terms of identifying and overcoming existing barriers and limitations. Of particular importance is prophylactic action, consisting of preventing the occurrence of many diseases, both somatic and mental, and in the case of illnesses, alleviating their course and consequences. Introduction of educational, promotional, and research programs can be an excellent way to fill this gap.

Future Recommendations

To take full advantage of the beneficial effects of physical activity, it is necessary to identify the barriers and obstacles to its introduction. They result both from the attitude of doctors and health professionals and the attitudes observed in the population, in those who are healthy and who have disease. Socio-economic barriers are also no less important, because physical inactivity translates into a deterioration in the general health of societies and an increase in morbidity and mortality, which in turn places a significant financial and resource burden on healthcare systems.

Department and Institution Where Work Was Done

School of Public Health, Center of Postgraduate Medical Education of Warsaw, Warsaw, Poland.

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