

Changes in the Addiction Prevalence in Polish Population between 1990-2019: Review of Available Data

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Abstract

The 1989 collapse of the socialist political system in Poland initiated an avalanche of modifications regarding healthcare policy resulting with new institutions and programs dedicated to monitoring and preventing addiction. In the current article, we look at the available data allowing to track changes in (1) the prevalence of exposure to addictive substances and behaviors, and (2) changes of addictions prevalence in Poland between 1990 and 2019. Analysis of all available studies on representative samples of Polish population conducted between 1990 and 2019 by sociological and epidemiological research companies and governmental organizations dedicated to the monitoring and treatment of addiction.

Our analysis shows decrease of exposed and addicted to tobacco respectively by 13% and 15%. Conversely, we noted an opposite, increasing tendency both in alcohol consumed per capita (a rise by 2.37 litres of pure alcohol per year) and a minor rise in the prevalence of alcohol use disorder within the general population (an increase by 0.2%). The available data connected to other addictions (drugs and behavioral addictions) are more sparse; and therefore has to be interpreted with caution.

The present analysis confirms the relative success of nationwide smoking-prevention initiatives introduced in Poland in the post-socialist period, as well as the lower efficiency of corresponding initiatives aimed at alcohol addiction. We identified flaws in the available data, which must be supplemented to carry out an efficient anti-addiction policy. Based on this analysis, future research directions have been formulated and critical research areas identified. The present work is also an opportunity to advocate for creating a more comprehensive and reliable addiction monitoring programs in Poland.

Keywords

Addiction, Behavioral addiction, Historical data, Poland, Substance use disorders

Abbreviations

CBOS: Public Opinion Research Center – one of the largest and most renowned research centers in Poland; **GHDx:** Global Health Data Exchange; **ICD:** International Classification of Diseases; **Kantar Public, Kantar TNS, OBOP, TNS OBOP:** names for one of Polish sociological research; agencies (they reflect names of this organization within the 30-year time period). **KBPN:**

National Bureau for Drug Prevention in Poland; **PARPA**: The State Agency for the Prevention of Alcohol-Related Problems

Introduction

Nowadays much attention is devoted to addiction policy, research and treatment, given its contribution to the development of other physical and mental health conditions (see e.g., [1-4]). Addiction is an important issue on a national level, causing very significant societal costs (e.g., [5-7]). High or unregulated exposure to addictive substance is an inherent factor contributing to addiction prevalence [8, 9].

Taking alcohol as an example, Belarus had one of the highest rates of alcohol consumption per capita in 2015 (17.1 liters of pure alcohol consumed per person; [10]). In the same year, the portion of Belarusians with alcohol use disorders was 4.12% [11], meanwhile in Mauritania, which has one of the lowest alcohol consumption rates (only 0.1 liter of pure alcohol consumed per person in 2015; [10]), the percentage of the population with alcohol use disorders was 1.14% in 2015 [11]. This illustrates the fact that the rate of substance abuse, in connection with cultural and social aspects of usage should be taken into consideration when assessing the national prevalence of addiction [12, 13].

However, nowadays not only substance dependence, but also behavioral addictions are taken into consideration by clinicians and researchers. The first step towards this recognition has been made in the DSM-5 [14], in which gambling disorder was classified as a *Substance-related and addictive disorder*. Other behaviors which – by some researchers – were suggested to have an addictive character (e.g., compulsive buying, stealing, Internet use or compulsive sexual behavior) were not included in this category, given that insufficient research on these matters was available (e.g., [15, 16]). International Classification of Disorders (ICD-11; [17]) in its 11th edition proposed recently by World Health Organization (WHO) also includes a section on disorders due to addictive behaviors, defined as Recognizable and clinically significant syndromes associated with distress or interference with personal functions that develop as a result of repetitive rewarding behaviors other than the use of dependence-producing substances. Disorders due to addictive behaviors include gambling disorder and gaming disorder, which may involve both online and offline behavior are also included in the same category [17]. Moreover, in the section of impulse control disorders of ICD-11, compulsive sexual behavior disorder have been also proposed [18], and there is ongoing discussion if it should be classified as an addiction (e.g., [19-22]). This expansion of the definition of addiction to certain behaviors following recent shifts in our understanding of this group of disorders should be taken into account when assessing the complete picture of the prevalence of addictions in a particular region or country.

In this study we aimed to address a lack of a comprehensive review of the trends in both - (1) mere exposure to addictive substances and behaviors, as well as (2) the prevalence of addiction in the Polish population, between 1990 and 2019.

Therefore, we reviewed data collected on representative Polish population samples. The analyzed results were – when possible – viewed through the lens of socio-political and historical changes and compared to select neighboring countries to Poland. In the analysis process, we identified shortfalls in the available data, and formulated future research directions. The baseline point for our data analysis, which is the year 1989, is significant, as it is the year the socialist political system ended in Poland and the beginning of democratic consolidation, resulting in reforms heading toward the establishment of a free-market economy [23, 24]. Communist and socialist governments had traditionally insisted that the problem of addictions is not at all present in socialist societies, and is a product of capitalist rule, emerging only in non-communist countries (e.g., [25]). The ending of the socialist regime in Poland has opened the door for addiction assessment and treatment initiatives, as well as rewriting national policies that address these issues on a national level.

As for data from other countries, an analysis based on the US population [9], has shown that 2.8% of the U.S. population displays symptoms of alcohol abuse or dependence; meanwhile 7.4% present symptoms of illicit drug abuse or dependence. Other comprehensive work about addictions concentrate not on quantitative analyses, but on historical perspectives on the disorder or cultural studies (see for instance [26-28]) – however, there is a lack of such analyses for post-communist countries in Eastern Europe. At the same time, health databases (such as, for instance European Monitoring Centre for Drugs and Drug Addiction; Global Health Observatory by World Health Organization or Institute for Health Metrics and Evaluation for alcohol and tobacco dependence) remain the primary source of comprehensive, quantitative information about the trends in usage of addictive substances, as well as the rate of addiction-related health problems in the populations of particular countries, which will serve as a reference to population percentages and trends observed in Poland.

Material and Methods

In order to explore the trends in dependence on substances and to elucidate the scale of behavioral addictions in the Polish population, we searched the leading sociological and epidemiological databases, as well as the databases of governmental organizations controlling systemic prevention and therapeutic programs for addicted people.

We have a priori defined 4 inclusion criteria for results of search: (1) data about substance use/addictive behavior frequency and addiction prevalence (2) in Polish population, (3) gathered within the timeframe of 1990-2019 on (4) representative samples. We were interested in: alcohol, tobacco, illicit substances (drugs), gambling, Internet use, online pornography use and compulsive buying. We selected the abovementioned addictive substances/behaviors due to their relative popularity within the Polish population as well as, for the behavioral addictions chosen, the scientific credibility of treating these behaviors as potentially addictive. Specific population or non-representative studies were not taken into

account.

We searched for the data in subsequent steps:

- On Global Health Data Exchange (GHDx), which integrates data on health-related issues from all over the world;
- On governmental websites;
- Bureau of Research, Chancellery of the Sejm – lower house of the Polish Parliament;
- Statistics Poland - the primary state agency providing statistical data about the Polish population and economy.
- On websites of specialized Polish agencies which coordinate the implementation of acts on counteracting addiction within the country;
- National Bureau for Drug Prevention (Polish abbreviation: KBPN) – a governmental institution aimed at coordinating the implementation of “*Act on counteracting drug addiction*”, and nowadays also focusing on programs of behavioral addiction prevention;
- The State Agency for the Prevention of Alcohol-Related Problems (Polish abbreviation: PARPA) – a specialized agency subordinated by the government and the Ministry of Health, aimed at coordinating the implementation of the “*Act on upbringing in sobriety and counteracting alcoholism*”;
- On websites of leading Polish sociological research agencies;
- Kantar Public (formerly known as OBOP, TNS OBOP or Kantar TNS) – Polish sociological research agency;
- Public Opinion Research Center (Polish abbreviation: CBOS) – one of the largest and most renowned research centers in Poland.

The search was performed mostly in Polish, except for GHDx database, when it was performed in English. The keywords for search were in Polish: (“uzależnien*” OR “częstość” OR “częstotliwość*” OR “użycie” OR “spożycie” OR “użytkowanie”) AND (“alkohol*” OR “nikotyn*” OR “papieros*” OR “konopi*” OR “marihuan*” OR “amfetamin*” OR “narkotyki*” OR “substancje nielegalne*” OR “substancje*” OR “behavioralne*” OR “hazard” OR “internet” OR “zakup*”). The same keywords in English were: (“addiction” OR “frequency” OR “usage”) AND (“alcohol” OR “nicotine” OR “tobacco” OR “cannabis” OR “marijuana” OR “amphetamine” OR “drug” OR “illicit substance” OR “substance use” OR “behavioral addiction” OR “gambling” OR “internet use” OR “compulsive buying”).

After extensive search, we found out that one additional agency, Gemius Audience, was the only one which gathered data about online pornography viewing, which was also of our interest. The data was not open access, and we obtained it on request for the purpose of this paper and other analyses available in a preprint by Lewczuk and colleagues [29].

From selected data sets we have extracted information on prevalence of substance use or addictive behavior frequency,

as well as the percentage of people who had symptoms of addiction to a particular substance or behavior. In the section *Results* below we present the data without any alterations – the percentages as presented in the original reports.

All 34 reports and data sets matching our inclusion criteria were presented in detail in [table 1](#).

Results

Alcohol use

Alcohol consumption

Figure 1 depicts the general rate of alcohol consumed each year per capita and divides it into three categories of beverages: (1) beer, (2) wine and mead, as well as (3) vodka, liqueurs and other alcoholic beverages. The data reflects the period between 1999 and 2015 as there was no systematic data from the period of 1990 to 1998.

Data presented on [figure 1](#) suggests that the general rate alcohol consumed each year per capita has been increasing since 1999. This trend is also observable in beer consumption, starting at 1999 and since 2002 (after a drop between 1999-2002), in consumption of vodka, liqueurs and other alcoholic beverages.

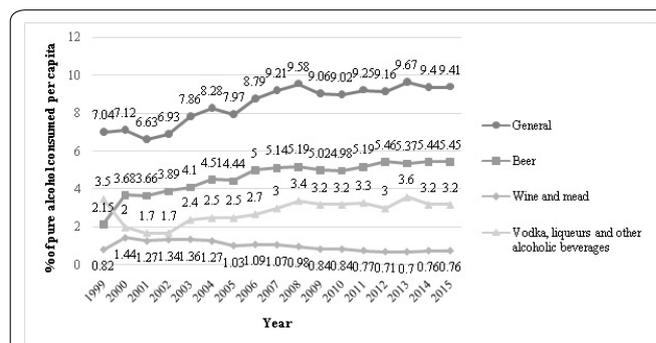


Figure 1: The amount of pure alcohol consumed in a particular year in the Polish population per capita. Note: The chart shows both the general consumption rate, as well as the consumption of each of three categories of alcoholic beverages: (1) beer, (2) wine and mead, (3) vodka, liqueurs and other alcoholic beverages. Note. Figure based on [30] and [31].

Exposure to alcohol use

There is no systematic data on exposure to the alcohol, however some data were collected in 2002, 2007-2010, 2012 and 2014. Figure 2 depicts percentages of people who admitted they had drunk alcohol 12 months before the study, constituting the basis of a report for a particular year. The data were obtained by subtracting the percentage of abstainers in the general population from 100% of the following reports: [32-38].

According to data presented on [figure 2](#), the percentage of non-abstainers in Poland oscillated between 72-85%. In all studies women appear to be abstainers more often than men. However, despite the representativeness of all of the reports which were the basis of the visualization, the results differ between the time points. This may be due to methodological differences in data collection. For instance, data from 2009

Table 1: Reports used for the present epidemiological study.

Addiction	Source and reference	Year of study	Age of participant	N	Type of data	Measures
Alcohol	Bureau of Research, Chancellery of the Sejm [30, 31]	1999-2015	Non-applicable	Non-applicable	Sale (consumption) of alcoholic beverages per capita	Data about the market of alcohol beverages from Statistics Poland
	PARPA [32]	1998, 2002	16+	No information	Number of abstainers in last 12 months	Face-to-face interviews, direct question about alcohol consumption
	CBOS [33]	2007	18+	931	Number of abstainers in last 12 months	CAPI method; direct question about alcohol consumption
	PARPA [34]	2008	18+	1075	Number of abstainers in last 12 months	Face-to-face interviews, direct question about alcohol consumption
	Statistics Poland [35]	2009	15+	30957	Number of abstainers in last 12 months	PAPI method, direct question about alcohol consumption
	CBOS [36]	2010	18+	899	Number of abstainers in last 12 months	CAPI method; direct question about alcohol consumption
	TNS [37]	2012	18+	3999	Number of abstainers in last 12 months	Telephone interviews; direct question about alcohol consumption
	Statistics Poland [38]	2014	15+	24156	Number of abstainers in last 12 months	Face-to-face interviews; direct question about alcohol consumption
	GHDx [11]	1990-2017	Age-standardized measure	Non applicable	Number of people displaying at least 3 symptoms of alcohol use disorders according to ICD-10	Integrated survey and statistical data from the national/international information providers
Tobacco smoking	OBOP [39]	1992	18+	1317	Usage of tobacco cigarettes	Face-to-face interviews; direct questions about usage and its regularity
	OBOP [40]	1993	16+	No information	Usage of tobacco cigarettes	Face-to-face interviews; direct questions about usage and its regularity
	OBOP [41]	1994	16+	2199	Usage of tobacco cigarettes	Face-to-face interviews; direct questions about usage and its regularity
	OBOP [42]	1995	16+	1112	Usage of tobacco cigarettes	Face-to-face interviews; direct questions about usage and its regularity

	TNS OBOP [43]	1999	15+	1038	Usage of tobacco cigarettes	Face-to-face interviews; direct questions about usage and its regularity
	TNS OBOP [44]	1999	15+	1109	Usage of tobacco cigarettes	Face-to-face interviews; direct questions about usage and its regularity
	TNS OBOP [45]	2000	15+	1008	Usage of tobacco cigarettes	Face-to-face interviews; direct questions about usage and its regularity
	CBOS [33]	2007	18+	931	Usage of tobacco cigarettes	CAPI method; direct questions about usage and its regularity
	CBOS [46]	2008	18+	1137	Usage of tobacco cigarettes	CAPI method; direct questions about usage and its regularity
	CBOS [47]	2010	18+	1021	Usage of tobacco cigarettes	CAPI method; direct questions about usage and its regularity
	TNS OBOP [48]	2010	15+	1003	Usage of tobacco cigarettes	Face-to-face interviews; direct questions about usage and its regularity
	CBOS [49]	2011	18+	1189	Usage of tobacco cigarettes	CAPI method; direct questions about usage and its regularity
	CBOS [50]	2012	18+	960	Usage of tobacco cigarettes	CAPI method; direct questions about usage and its regularity
	Kantar Public [51]	2017	15+	1063	Usage of tobacco cigarettes	CAPI method; direct questions about usage and its regularity
	CBOS [52]	2019	18+	1077	Usage of tobacco cigarettes	CAPI method; direct questions about usage and its regularity
Illicit substances	KBPN [53]	2002	16+	3148	Usage of amphetamine, cocaine, cannabis, heroin, LSD, hallucinogenic mushrooms, ecstasy	Face-to-face interviews; questions about types of substances taken in lifetime, in last 12 months and last 30 days
	KBPN [54]	2006	15-64	1365	Usage of amphetamine, cocaine, cannabis, heroin, LSD, hallucinogenic mushrooms, ecstasy	Face-to-face interviews; questions about types of substances taken in lifetime, in last 12 months and last 30 days

	KBPN [55]	2008	18-75	1003	Usage of amphetamine, cocaine, cannabis, heroin, LSD, hallucinogenic mushrooms, ecstasy	10-item questionnaire realized via telephone interviews; questions about usage of various drugs in lifetime
	KBPN [56]	2009	15-75	1001	Usage of amphetamine and cannabis	CAPI method; questions about usage of substances in lifetime, last 12 months and last 30 days
	KBPN [57]	2010	15-64	3900	Usage of amphetamine, cocaine, cannabis, heroin, LSD, hallucinogenic mushrooms, ecstasy	CAPI method; questions about types of substances taken in lifetime, in last 12 months and last 30 days
	KBPN [58]	2012	15-64	3428	Usage of amphetamine, cocaine, cannabis, heroin, LSD, hallucinogenic mushrooms, ecstasy	CAPI method; questions about usage of particular drugs with regard of lifetime, last 12 months and last 30 days
	KBPN [59]	2013	15+	1000	Usage of amphetamine, cocaine, cannabis, heroin, LSD, hallucinogenic mushrooms, ecstasy	CAPI method; questions about usage of particular drugs with regard of lifetime, last 12 months and last 30 days
Gambling	CBOS [60]	2012	15+	4038	Usage and estimation of gambling addiction risk	CAPI method; direct questions about usage, CPGI
	CBOS [60]	2014	15+	2502	Usage and estimation of gambling addiction risk	CAPI method; direct questions about usage, CPGI
	CBOS [61]	2019	15+	4025	Usage and estimation of gambling addiction risk	CAPI method; direct questions about usage, CPGI
Internet	CBOS [60]	2012	15+	4038	Usage of Internet and estimation of Internet addiction risk	CAPI method; Internet Addiction Test by Young
	CBOS [60]	2014	15+	2502	Usage of Internet and estimation of Internet addiction risk	CAPI method; Internet Addiction Test by Young
	CBOS [61]	2019	15+	4025	Usage of Internet and estimation of Internet addiction risk	CAPI method; Internet Addiction Test by Young

Online pornography	GemiusAudience [62]	2004	7+	16883	Usage	Internet traffic data for a particular month (October)
	GemiusAudience [62]	2006	7+	20143	Usage	Internet traffic data for a particular month (October)
	GemiusAudience [62]	2008	7+	16647	Usage	Internet traffic data for a particular month (October)
	GemiusAudience [62]	2010	7+	15087	Usage	Internet traffic data for a particular month (October)
	GemiusAudience [62]	2012	7+	11425	Usage	Internet traffic data for a particular month (October)
	Gemius Audience [62]	2014	7+	11543	Usage	Internet traffic data for a particular month (October)
	Gemius Audience [62]	2016	7+	118721	Usage	Internet traffic data for a particular month (October)
Compulsive buying	CBOS [60]	2012	15+	4038	Percentage of people with addiction	CAPI method; Valence, d'Astous and Fortier Compulsive Buying Scale
	CBOS [60]	2014	15+	2502	Percentage of people with addiction	CAPI method; Valence, d'Astous and Fortier Compulsive Buying Scale
	CBOS [61]	2019	15+	4025	Percentage of people with addiction	CAPI method; Valence, d'Astous and Fortier Compulsive Buying Scale

Note. *N – number of participants of a particular study; CAPI – computer-assisted personal interview, PAPI – paper and pencil interviewing.

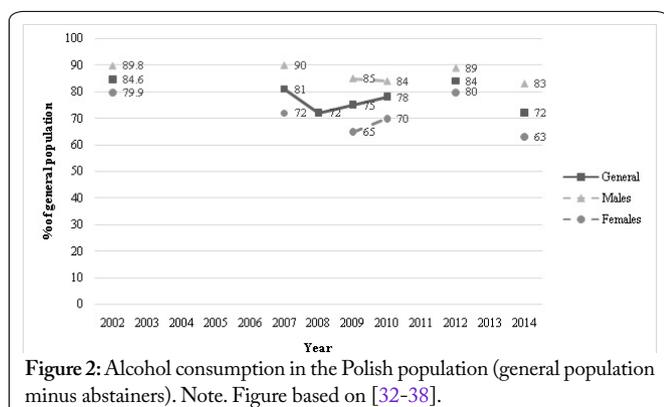


Figure 2: Alcohol consumption in the Polish population (general population minus abstainers). Note. Figure based on [32-38].

[35] were collected using paper-pencil questionnaires, whereas in 2012 [37] telephone interviews were used. In the case of all other time points, the data was gathered in face-to-face

interviews. This factor might be partly responsible for the variability of results throughout the years.

Alcohol use disorders

For each year between 1990 and 2017 systematic data on alcohol use disorder were collected. Figure 3 presents the percentage of people displaying at least three symptoms of alcohol use disorders according to ICD-10 [63] during a year preceding the study. The data compiled for this figure was obtained from Global Health Data Exchange [11].

The data presented on figure 3 suggests that the percentage of people displaying symptoms of alcohol use disorders remained at a relatively stable level: close to 2% in the general population, 3% among men and 1% among women (females appear to suffer from alcohol use disorders less frequently than men), however, a very slight, but also stable increase in the indices is evident within the analyzed period.

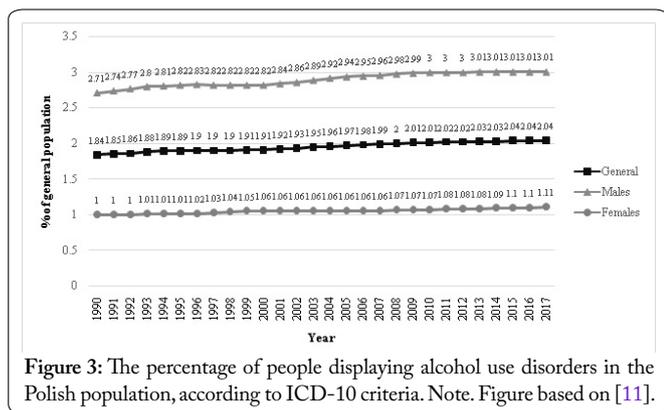


Figure 3: The percentage of people displaying alcohol use disorders in the Polish population, according to ICD-10 criteria. Note. Figure based on [11].

Tobacco cigarettes smoking

Exposure to tobacco

Data on tobacco use are more sparse than for alcohol. Figure 4 depicts percentages of both occasional and regular tobacco cigarette smokers among members of the general Polish population, and by gender.

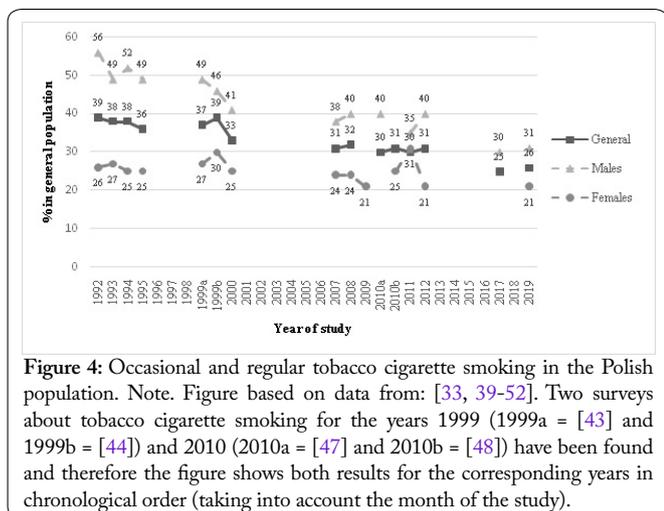


Figure 4: Occasional and regular tobacco cigarette smoking in the Polish population. Note. Figure based on data from: [33, 39-52]. Two surveys about tobacco cigarette smoking for the years 1999 (1999a = [43] and 1999b = [44]) and 2010 (2010a = [47] and 2010b = [48]) have been found and therefore the figure shows both results for the corresponding years in chronological order (taking into account the month of the study).

Problematic use of tobacco

Figure 5 depicts the general percentages of regular tobacco cigarette smokers among Polish population members, and by gender. The gaps in data between 2007-2012 are due to a lack of information in reports about gender differences in regular cigarette smoking.

Data presented in figures 4 and 5 show that there is a drop in the popularity of tobacco cigarette usage reflected by the percentage of smokers within the general population and among males; the trend pertains to the percentages of general smokers and regular smokers. The percentage of females who generally use tobacco seems to have remained relatively stable, oscillating between 20-25% of the general female population. The most significant changes in the usage of tobacco can be observed between 1990 and 2000 in the estimates of the general population and among men. Among men, there is also an observable drop between two time points between the years 2000 and 2012, however there is a lack of data in the intermediate period.

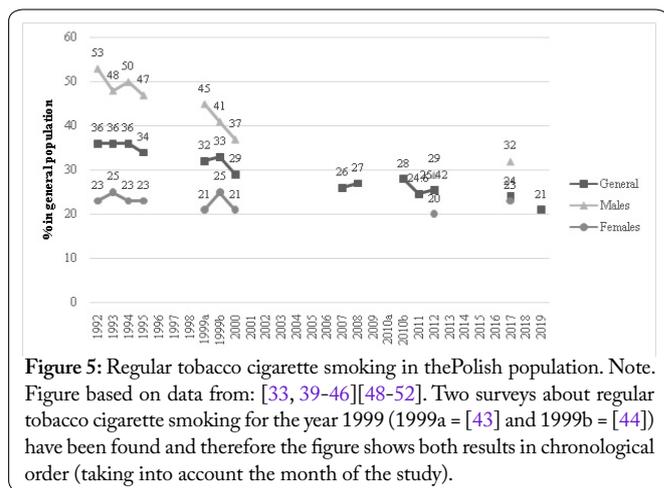


Figure 5: Regular tobacco cigarette smoking in the Polish population. Note. Figure based on data from: [33, 39-46][48-52]. Two surveys about regular tobacco cigarette smoking for the year 1999 (1999a = [43] and 1999b = [44]) have been found and therefore the figure shows both results in chronological order (taking into account the month of the study).

Illicit substance use

Throughout the years, cannabis and amphetamine remained the most popular drugs in Poland. Due to the high popularity of these drugs, we decided to visualize the available data at figures 6 and 7. Data on other, less popular drugs, are available in the Supporting information (Figures S1-S4).

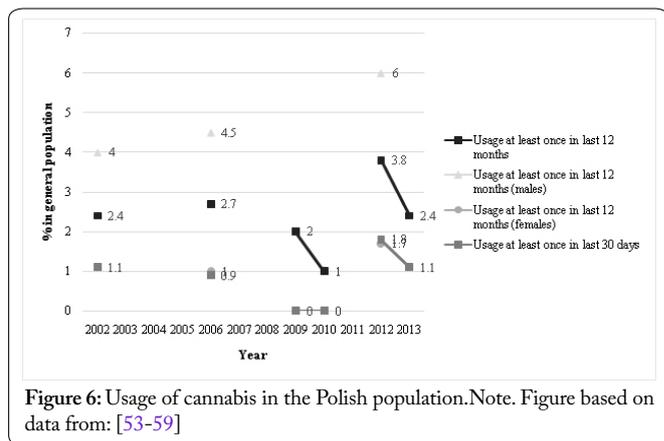


Figure 6: Usage of cannabis in the Polish population. Note. Figure based on data from: [53-59]

Cannabis

Figure 6 depicts the usage of cannabis in Poland with regard to recent consumption: at least once in last 12 months and in the last 30 days.

Data on percentages of lifetime users of cannabis are shown at figure S5 in the Supporting information.

The data shown in figure 6 suggests that the percentage of cannabis users in the general Polish population who used the drug at least once within the 12 months preceding the study hovers around 2.4% of the general population (2.4% in the last study from 2013). At the same time, the percentage of users who admit to using cannabis in the last 30 days preceding the survey fluctuates around 0.8% (1.1% in the last study from 2013).

Data on percentages of lifetime users of cannabis show that 10-17.6% of males and 3.4-6.6% of females had contact with cannabis and this ration has increased between 2002 and 2012. These results are shown at figure S5 in the Supporting information.

Amphetamine

Similarly to cannabis, there are a lot of missing time points in data on amphetamine use. Figure 7 depicts the usage of amphetamine in Poland with regard to recent consumption: at least once in last 12 months and in last 30 days.

Data shown in figure 7 suggests that amphetamine usage by females hovers around 1.5% (1.4% in the study from 2012). Usage of this drug at least once in 12 months preceding the study hovers around 0.7% in the general population (0.4% in the last study from 2013). At the same time, the percentage of users who admit to using amphetamine in the 30 days preceding the survey fluctuates around 0.2% (0.4% in the last study from 2013).

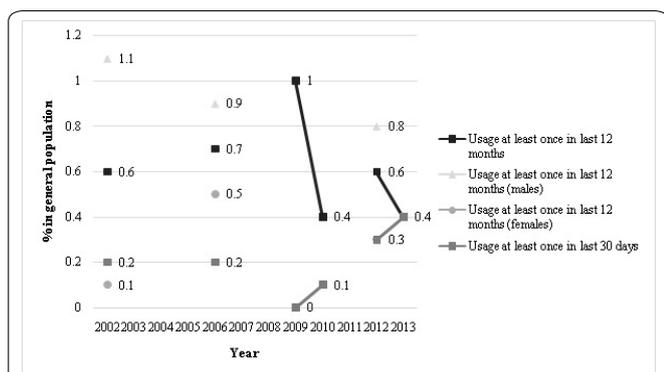


Figure 7: Usage of amphetamine in the Polish population. Note. Figure based on data from: [53-59].

Figure S6 in the Supporting information depicts the percentages of lifetime users of amphetamine with regard to gender. These results show that 2.7-4.5% of males and 0.7-1.4% of females had contact with amphetamine and this ration has increased between 2002 and 2012. Additionally, in the supporting information, figures S1-S4 provide data on usage of other illicit substances (cocaine, heroin, LSD, hallucinogenic mushrooms and ecstasy) in the 12 months preceding the study (in the general population, among males and females), as well as within 30 days before the study.

Gambling

All data on gambling are gathered from reports by CBOS [60, 61], which provide the data only on three time points: for years 2012, 2014 and 2019 (Figure 8).

The data presented on figure 8 shows that there was a 13.9% rise in the percentage of people who gambled at least once in 12 months preceding the study, among members of the Polish population (23.2% in 2012, 37.1% in 2019). The data is also organized into percentages of gambling men (a rise by 14.9%; 28.4% in 2012, 43.3% in 2019) and gambling women (a rise by 13%; 18.5% in 2012, 31.5% in 2019). According to the data, in Poland, more men than women gamble.

Figure 9 depicts percentages of people in the general Polish population, who were identified to be at risk of developing gambling addiction or gambling problematically according to their results in the Canadian Problem Gambling Index [64].

There was an increase of 1.3% in the percentage of people

within the general Polish population (2.6% in 2012, 3.9% in 2014; Figure 9), who were at minor risk of gambling addiction, however, there was a decrease by 0.2% in people with moderate risk of developing gambling addiction (0.9% in 2012, 0.7% in 2014), meanwhile there was also an increase of 0.5% in the percentage of people displaying symptoms of problematic gambling (0.2% in 2012, 0.7% in 2014).

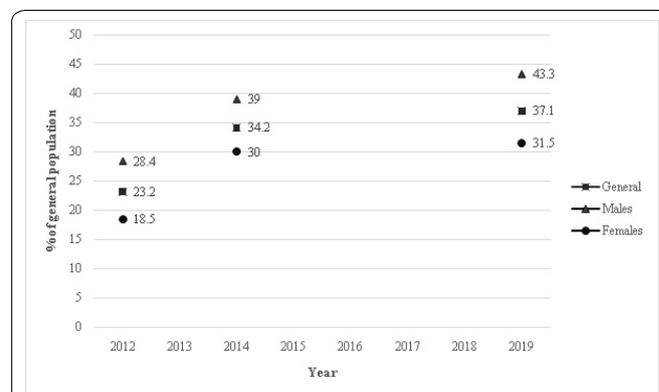


Figure 8: People who gambled at least once during the 12 months before the study as a percent of the Polish population. Note. Figure based on data from [60] and [61].

In supporting information the data on risk of gambling addiction among Polish gamblers is presented. According to these data for 2012 and 2014 respectively, 11.2% and 11.4% of them displayed a minor risk, 3.8% and 2.2% were at moderate risk of developing addiction and 1% and 2.2% had symptoms of problematic gambling (see Figure S7).

Moreover, data presented in reports by Badora et al. [60] and Moskalewicz et al. [61] provides evidence that among gamblers, males display symptoms of problematic gambling, more frequently than females. For both sexes, the percentages of people displaying symptoms of problematic usage among gamblers were very similar in the time window between 2012 and 2014 (20.4% vs 21.4% among males, 9.8% vs 9.1% among females). The visualization of this data is provided in Supporting information (Figure S8).

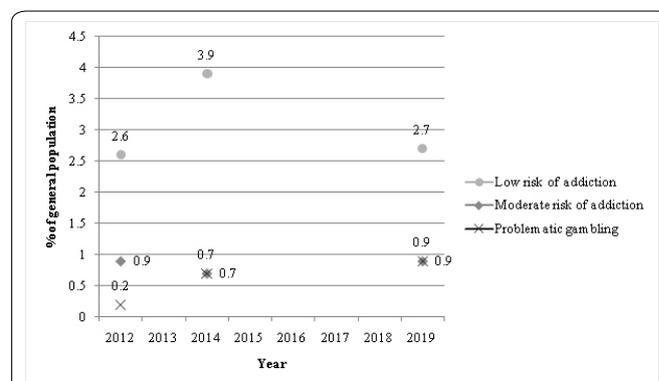


Figure 9: Risk of gambling addiction in the Polish population. Note. Figure on the basis of data from [60] and [61].

Problematic internet use

All data on problematic Internet use comes from reports

by CBOS [60, 61] on behavioral addictions, which provide data from three time points: 2012, 2014 and 2019. In these studies, the Internet Addiction Test by Young [65] was used to assess whether participants fall into the criteria for Internet addiction. The results are shown at figure 10.

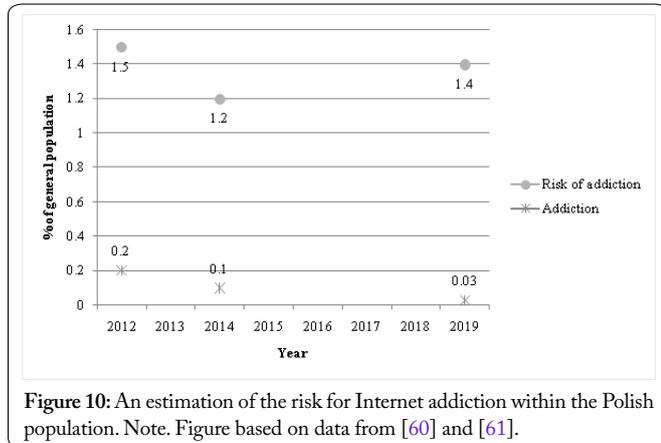


Figure 10: An estimation of the risk for Internet addiction within the Polish population. Note. Figure based on data from [60] and [61].

The data presented in Figure 10 shows that the percentage of people who are at risk of Internet addiction remains at a relatively stable level – 1.5% in 2012 and 1.4% in 2019. However, in 2019 the percentage of people addicted to the Internet was very low – 0.03%, meanwhile in the preceding time windows it was on the level of 0.1-0.2%.

Online pornography viewing

All data regarding online pornography viewers were obtained from GemiusAudience [62]. The Gemius data differs from the abovementioned data provided by CBOS [60] [61] due to a difference in the target population of the study – CBOS conducted its research on the population of Poles above the age of 15, meanwhile Gemius Audience included the general Polish population of above the age of 7 (Figure 11).

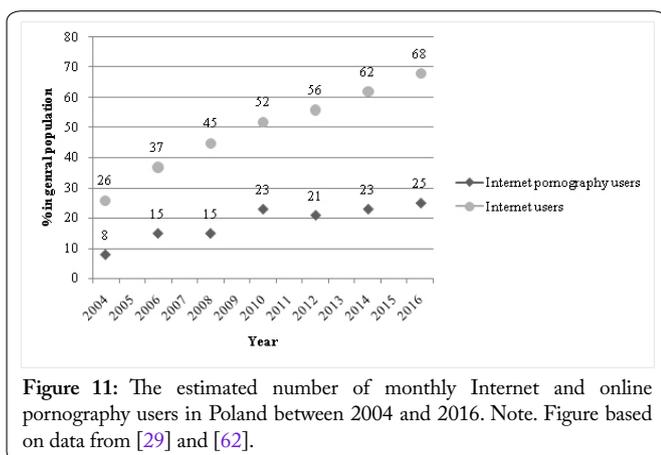


Figure 11: The estimated number of monthly Internet and online pornography users in Poland between 2004 and 2016. Note. Figure based on data from [29] and [62].

As shown in figure 11, generally, both the percentage of Internet users and online pornography viewers in the Polish population has increased between 2004 and 2016. The estimated percentage of people who use the Internet from their computers (the data does not include mobile devices) has been

rising from 26% in 2004 to 68% in 2016. Within the same time window, the percentage of online pornography viewers increased from 8% in 2004, to a relatively stable percentage of 15% in 2006 and 2008. Percentages rose again to 23% in 2010, decreasing by 2% to 21% in 2012 and rising again in 2014 to 23%, and to 25% in 2016. This indicates over a 3-fold growth in the estimated number of general Polish population members using online pornography between 2004 and 2016; simultaneously, the group of Internet users grew to 2.5 times the original percentage.

Compulsive buying

Data on compulsive buying is gathered from reports by CBOS [60, 61] on behavioral addictions. In these studies, the Valence, d’Astous and Fortier Compulsive Buying Scale [66] was used to assess whether participants match the criteria for compulsive buying.

Figure 12 depicts data on compulsive buying in the Polish population, taking into account gender differences.

Data from between 2012 and 2019 show that the percentage of people displaying compulsive buying symptoms in the general Polish population is relatively stable (3.5% in 2012; 3.7% in 2014). According to the data, more women than men show symptoms of compulsive buying in Poland.

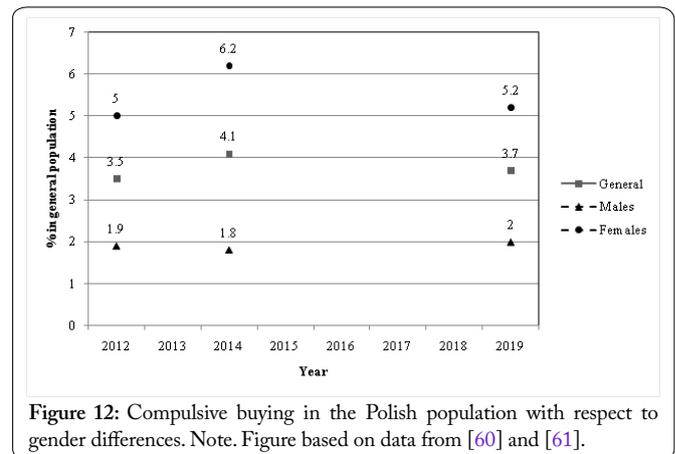


Figure 12: Compulsive buying in the Polish population with respect to gender differences. Note. Figure based on data from [60] and [61].

Discussion

The present review focuses on the prevalence of substance and non-substance (behavioral) addictions in the Polish population, and encompasses almost three decades of representative population studies conducted in the post-socialist period in Poland (span of years: 1990-2019, although most reviewed studies account for shorter periods). The purpose of the article was (1) to show the available data on the changes in the prevalence of addictive behaviors in the Polish population after the collapse of socialist regime, but, by the same token, (2) to highlight the shortages in available studies and (3) to recommend areas for future research.

Alcohol

Data about alcohol use in Poland were available thanks to

various governmental institutions (Statistics Poland, Ministry of Health, PARPA), as well as sociological research centers. The data presented in the article shows that the usage of alcohol in the Polish population oscillates between 72-85%, with an increasing trend in the rate of consumption of alcohol in general (except for wine and mead, where a decreasing trend might be observed) [30, 31]. A GHDx database [11], which integrates information from various sources (sociological, governmental and scientific) provided the percentages of people in the general population displaying symptoms of alcohol use disorders according to ICD-10 [63] since 1990. Analyzing this data, a slight rise can be observed between 1990 and 2017 in the percentage of the general population displaying symptoms of alcohol use disorders (from 1.84% in 1990, to 2.04% in 2017). This increasing trend might be observed among both males (2.71% in 1990, to 3.01% in 2017) and females (1% in 1990; 1.11% in 2017; [11]). Moreover, an interesting pattern can be observed between 1990-2017 in the consumption rate of pure alcohol per capita, which has also been increasing (7.04 litres yearly per capita in 1990, 9.41 litres in 2015) [30, 31].

In comparison to countries neighboring Poland, Poland has the penultimate lowest national rate of pure alcohol consumed per capita (with Germany being the last on the list; [10]). What is more, the percentage of Polish people displaying symptoms of alcohol use disorders was very similar to that of the Czech Republic, Slovakia and Germany across 1990-2017 (ca. 1, 5-2% each year in these countries, [11]). Contemporaneously, in the Eastern countries this percentage appeared to be higher (ca. 4% in Ukraine, Lithuania, Belarus and 5% in Russia, [11]). This indicates a stronger resemblance between Poland and its Western neighbors than with Eastern neighbors in terms of alcohol consumption and alcohol-related indices.

Tobacco use

Tobacco cigarette usage is studied by social research institutions, in studies about attitudes on tobacco usage overall, and surrounding the introduction of new smoking-related laws. Tobacco dependence can be assessed by the percentage of people claiming to use it regularly in the abovementioned surveys. Regarding tobacco, a decrease is visible in the percentage of use (from 39% in 1992 [39] to 26% in 2017; [52]), especially among men (from 56% in 1992; [39] to 31% in 2019; [52]). The drop was not as significant among females, although it was difficult to assess due to a lack of gender-differentiated data in many time windows (26% in 1992 [39], a peak at 27-30% in 1999 [43, 44] to 21% in 2019 [52]).

According to the Global Health Data Exchange, since 1990 there has been a visibly decreasing trend in the estimates of total daily tobacco users in the United States and most Western European Union countries [11]. Therefore, the drop of usage in Poland resembles shifts observable in other countries, although some of the success in decreasing the smoking rate in the Polish population was potentially attributed to socio-economic factors. In 1990, when a market economy was introduced to Poland after the end of the socialist

system, the tobacco industry became privatized, and 90% was bought by multinational corporations [67]. North America was no longer a potential market for the development of the tobacco industry due to the declining prevalence of smokers. Consequently, Eastern Europe, including Poland, became a strategic target for tobacco marketing. In this time period, the sale of cigarettes was projected to boost upwards by 10-20% [68]. However, despite lobbying and in reaction to an increasing awareness about the health consequences of smoking tobacco, numerous steps were taken to efficiently diminish the consumption rates, materializing in the establishment of first non-governmental organizations focused on tobacco usage prevention in cooperation with WHO (see [69]). Moreover, in 1995, when the "Act on protection of public health against the effects of tobacco use" was issued, requirements for health warnings on cigarette packages became mandatory; bans were initiated on cigarette advertisements in the media, on selling to minors, on smoking in enclosed workspaces, and health centers were introduced. Since then, many further regulations have been consequently issued, focusing on the prevention and restriction of smoking tobacco in public places [67, 70].

Additionally, a financial constraint which may have contributed to the drop in tobacco use is linked to Poland's incorporation into the European Union, since then, Poland was obligated to adjust the prices to match European law regulations (see [71]), especially within the legal market. The health policy adopted in Poland regarding tobacco use was praised by WHO as an example for the rest of the world (see [72]) and its high efficiency might be the most important factor contributing to the observable drop of the percentage of tobacco smokers.

Illicit substance use

Regarding illicit substance usage, analyzed studies were conducted by CINN – a unit reporting to EMCDDA. The majority of these surveys were methodologically coherent, except for 2008, when telephone interviews were conducted instead of face-to-face surveys. Data on illicit substance dependence is lacking. The available reports provided us with information that the most popular drugs are cannabis and amphetamine. Cannabis is also the most popular illicit substance in the Central European region [73], meanwhile amphetamine is the most popular stimulant drug in Poland and in Scandinavian countries [59, 73]. For cannabis, the percentage of users in 12 months before the study oscillates between 1-3.8% and users in last 30 days before the study – between 0-1.8%. For amphetamine, the percentage of users in 12 months before the study oscillates between 0.4-1% and of users in last 30 days before the study – between 0-0.4%.

In 2012, [58] a peak in all the usage percentages, both for cannabis and amphetamine, might be observed, however, in the next survey in 2013, [59] the percentage of users (including lifetime users) decreased (except for the percentage of amphetamine users in last 30 days, where the percentage was nearly at the same level with an increase by 0.1%). Although the 2012 study used computer-assisted personal interviews, which were similar to the majority of referred research on

cannabis usage (except from the 2008 telephone survey), the difference is clearly visible. This indicates a direction for future studies to adhere to strictly defined methodology in order to obtain comparable data.

Behavioral addictions

Regarding behavioral addictions, reports by Badora et al. [60] and Moskalewicz et al. [61] provided us with information about their prevalence. However, they encompass only three time windows: 2012, 2014 and 2019, and focus only on some selected addictions. There is an increasing trend in the prevalence of behavioral addictions (pathological gambling, problematic internet use, compulsive buying) in general. A similar trend is observed for online pornography viewership [62], although data on the pathological form of pornography use (e.g., compulsive sexual behavior disorder, [17]) is not available at this moment for the Polish population.

Gambling

For gambling, the percentage of users in the general population in the year preceding the study increased by 13.9%, reaching 37.1% in 2019. At the same time, the percentage of people displaying some symptoms of risky gambling (assessed by Canadian Problem Gambling Index) has been relatively stable (3.7% in 2012 and 3.6% in 2019) among the people who gamble, the percentage of problematic gamblers rose from 0.2% in 2014 to 0.9% in 2019. More men than women in Poland gamble and are at higher risk of developing symptoms of problematic gambling [60, 61]. A systematic review on the prevalence of problematic gambling worldwide between 2000 and 2015 [74] provided evidence that in Europe the percentages of problematic gamblers within national populations oscillated between 0.12-3.4%. Comparatively, the percentages observed in Poland appear to be similar to these trends.

Problematic internet use (PIU)

The percentage of people at risk of developing PIU (assessed by Internet Addiction Test by Young) has been relatively stable from 2012 to 2019, being at a level of 1.2-1.5% of the general population. Concurrently, the percentage of addicted people remained at a relatively stable level between 2012 and 2014 (a drop by 0.1%) [60] to drop to 0.03% in 2019 [61]. This is a very interesting difference which might stem from the popularity of Internet usage and, for many people constant mobile access to the Internet in 2019 compared to 2014 and 2012. Identifying oneself as a problematic Internet user in general might have been difficult, when not specifying an addictive activity performed on the Net. However, compared to other countries, this percentage appears to be very low. According to a meta-analysis by Cheng and Yee-Iam Li [75], the prevalence of PIU within the general population of South and Eastern Europe is estimated to be 4.4-7.7%; meanwhile for Northern and Western Europe it's between 1.0-4.1%; and for North America it is 3.2-12.9%. These estimations are based on various studies using either the Young Diagnostic Questionnaire or Internet Addiction Test by Young (the latter also used in Polish CBOS study by Badora et al. [60]). Given

that Polish data encompasses only three time windows, the results obtained in Poland should be treated with caution and the issue regarding the prevalence of PIU ought to be investigated further.

Online pornography viewing

Although pornography use itself does not constitute addiction, previous studies have shown that viewing pornography can be highly addictive, and conducive to harmful consequences for a significant part of the population. In recent population studies, between 4% [76] to 8.6% [77] of respondents recruited from the US population reported pornography addiction. Some previous research showed that excessive pornography viewing is best explained in the addiction framework [20, 78, 79]. For online pornography viewing, based on the data from the 12-year GemiusAudience study [62], the estimated monthly percentage of online pornography users in general populations grew over three times (310%) - from 8% of the population in October 2004, to around 25% in October 2016. This is a very pronounced increase, which can be seen as a major concern [80], since online pornography use grew the fastest of all analyzed behaviors with a high potential for addiction. As was mentioned before, data on the newly included in ICD-11 compulsive sexual behavior disorder [17] prevalence in Poland is unavailable. Unfortunately due to a lack of data on actual pornography addiction, we focused solely on online pornography viewership; one of a few more categorical elements of Compulsive Sexual Behavior Disorder.

Compulsive buying (compulsive shopping)

Across three time windows of 2012, 2014 and 2019, the percentage of people displaying symptoms of compulsive buying remained relatively stable (between 3.5-4.1%) with women being more prone to develop symptoms than men [60, 61]. In numerous studies, women were more often the subjects of clinical studies on compulsive shopping. Moreover, clinical surveys and community-based studies posited that women were more prone to developing compulsive buying behaviors (see for instance [81-83]). However, the influence of gender on the prevalence of compulsive buying (or shopping) disorder is under dispute over whether these gender differences are real, or rather artefactual, and ascribable to an underrepresentation of men in research samples [84], or if men are less likely to acknowledge their inclination for shopping and defining their compulsive behavior as "collecting" [85]. Additionally, some reports show a similar rate of compulsive buying symptoms among males and females [86, 87]. Studies analyzed in the current report were based on representative samples of the Polish population. However, in further studies, it is worth controlling for whether men adequately recognize their consumptive behaviors.

Conclusion

Our review indicated that tobacco addiction and alcohol addiction were the subjects of the highest number of investigations after 1989. This is understandable, as both of these addictions constitute a significant problem in Polish

society and are associated with significant societal costs (see e.g., [7, 88] and research on them is supported by governmental funds. We also identified a set of problems to be solved in future research. Based on our review, when estimating the changes in the prevalence of addictive behaviors in the Polish population one can stumble on a few specific problems: (2) data scarcity: the number of available studies on representative samples estimating the prevalence of addiction is very small. Future research should focus on providing more data on this socially impactful topic; (2) lack of a unitary methodological approach: the available studies operationalize various addictive behaviors and their frequency in different ways, making the comparison of the results of two or more separate studies very difficult; (3) most studies focus on a single example of addictive and do not assess the full addiction spectrum starting from mere exposure, through occasional use, problematic use and finally full symptom addiction; (4) almost all available studies are based on participants' declarations regarding their engagement in a particular addictive behavior and objective assessment is missing. Because of biases associated with declarative data, especially for behaviors that are socially stigmatized (i.e., strong social desirability bias, like in the case of addictions [89]), these studies should be supplemented by a higher number of analyses that use objective indicators to measure the frequency of addictive behaviors in a population.

Author Contributions

Manuscript was contributed by IN conducting literature review, providing summary of reviewed studies and primary role in writing the manuscript. KL and MG contributed in manuscript concept and design, secondary role in writing the manuscript and critical revision of the manuscript for significant intellectual content. All authors contributed to and have approved the final version of the manuscript. All authors take responsibility for the integrity and accuracy of the analysis.

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Synopsis

This is the first article to comprehensively review the addiction prevalence in Poland after the collapse of the socialist system in 1989. The data on addiction prevalence was gathered in a search of databases of leading Polish research agencies, publicly available world health datasets, and, in case of one type of addiction, were obtained on request from a research agency. The paper aims to overview the percentages of users and addicts of various substances (alcohol, tobacco, illicit drugs) and behaviors (gambling, Internet usage, online pornography viewing, compulsive buying) and presents this overview in the historical context. The flaws and gaps in the data were identified, advocating for well-designed and carefully planned research in the field. The paper might be helpful for understanding the tendencies and popularity of various addictions across the years as well as for finding

out future research avenues in the field, especially in Central Europe.

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