

Effects of weather on suicides

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Abstract The complex system of the human body is affected by outer environment. The discomfort caused by the disorder of autonomic nervous system can't be neglected when soul and body is investigated in connection with weather changes. Fronts and associated dynamic processes can disturb these ongoing functions. Weather sensitivity and general discomfort can be explained, because human endurance is decreased by rapid changes.

Biometeorology deals with strong, unexpected meteorological changes. That's why synoptic analysis – i.e. in case of fronts – differs from the changes in the human body caused by biometeorological effects. Adaptation processes to weather fronts depends on personal biological and psychological characteristics. Accordingly, reactions, the measure and efficiency of reactions can be divided to different sensitivity classes. Firstly, there are people who have dynamic adaptational skills. They are not sensitive to rapid changes. Secondly, there are weather sensitives, who are in an increased risk-group. And the last group is the "sick of weather changes". They are practically not able to adapt meteorological variability.

Meteorological processes is attempted to describe by weather classification in the last half of the century to forecast frequent complaints and discontents in typical meteorological situations.

We made an attempt to generate a special biometeorological classification to survey suicides in Hungary from 1970 to 2004.

1. Introduction

It was noted in the last century, that finished suicides had a seasonal rhythm (Durkheim, Morselli). The maximum of committed suicides is in the late spring-early summer period, as written in the literature. Not according to beliefs, as people feel depressed on cloudy, foggy winter days.

The bioclimatological explanation comes up simultaneously as socio-psychological theory.

Modern bioclimatic researches used meteorological data, but no coherent results found in the last decades. (Dixon és Shulman, 1983; Deisenhammer, Kemmler és Parson, 2003).

The sociological idea belonged to Durkheim, and the modern version basic reasons is from Gabennesch, who called this phenomenon „broken promise effect”.

2. Data

For our research, we used the public national suicide database of the Central Office of Statistics from 1970 to 2004. 139242 finished suicides were examined, which means 10,9 daily average suicides. In this 35-year-period there were only 3 days when suicides didn't happen. Data were divided into male and female groups, 2 age groups (to 59 years and after it) and in space to the central, the eastern and the western part of Hungary (because of the economic and welfare differences of the population).

Suicide is a complex and mystic multi-causal behaviour of human kind. Hidden biological constitution could be in the background, the victim's own psychic aptitude,

learnt behaviour, traditions, social environment, movement and happenings of culture and society. In view of these causes, less suicides found in the western part of Hungary is not a coincidence. In time, most of the weekly suicides happen on Monday and the less on weekends.

At first, meteorological parameters, like temperature (maximum, minimum and average), sunshine duration, wind speed, cloudiness were used (daily data, spatial mean). The lack of front diary led us to use Péczy-macrosynoptic types (Péczy, 1957, 1983), and from this we formed primer front database for the whole period. In Hungary we use 13 Péczy-types to characterise synoptic situation to describe the current state of the atmosphere, cyclones and fronts in the Carpathian Basin.

3. Filter of social and economic effects

The decrease of suicides after the changes of political life (1990) refers to the role of social and economic effects. While between 1968-87 Hungary was the first place with the highest suicide rate in the world (Figure 1).

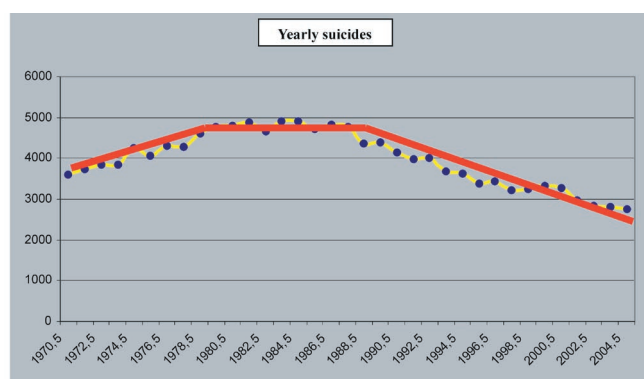


Figure 1 Suicide rate of the 1970–2004 period

Based on Figure 1, the 35 year was divided to 3 periods:

- 1970–1978,
- 1979–1987,
- 1988–2004.

To filter socio-economic effects in each period each coefficient of linear trends were extracted from the national suicide rate. Average yearly trend was counted from the received anomaly series. Since in each period for every day only 9, 9 and 17 year's exact days remained, so that yearly trends were sought in a trivial form. After this filter our aim was to eliminate only other - not meteorological - sources. By the way yearly trends are not only realised in meteorological parameters, but in other factors of soul and manner.

The polynomial of 6th degree of the 3 period shows the differences in yearly data (Figure 2.). According to the 1st period, the 2nd one shows a sharp decrease in the beginning, and has a higher maximum. At the end of the 3rd period increased suicide rate refers to X-mas and New Years Eve.

Besides in every period in early summer finished suicides suddenly increase.

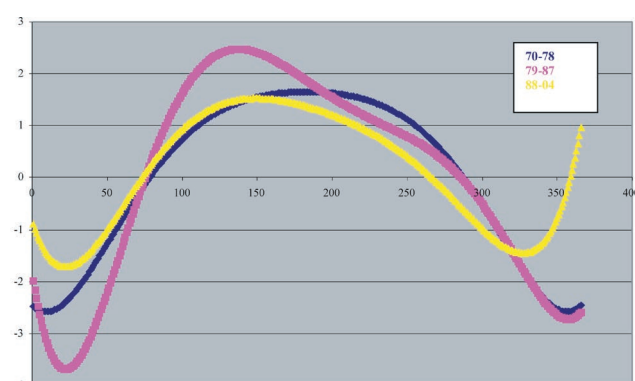


Figure 2 Smoothed yearly curves

Deviation was also defined for the same 9, 9 and 17 years to filter yearly trends from it. But Figure 3 showed that moderate curves didn't justify it.

Smoothed yearly curves of deviation (Figure 3.) is not notable, so that difference of suicides and monthly means were not normalized with deviation. We divided the year to summer and winter half.

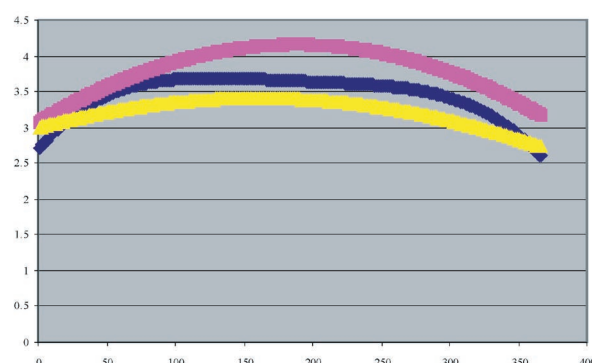


Figure 3 Smoothed yearly curves of deviation (with the same colours)

In the next picture (Figure 4.) frequency distributions of the winter and summer half years will be seen, after the reduction by slow trends and the yearly rhythm approximated by polygonal of 6 degrees. In every period, median is under mean of the distribution, so that daily suicide cases under the average is more frequent. In return rather high numbers can occur in the middle of the period.

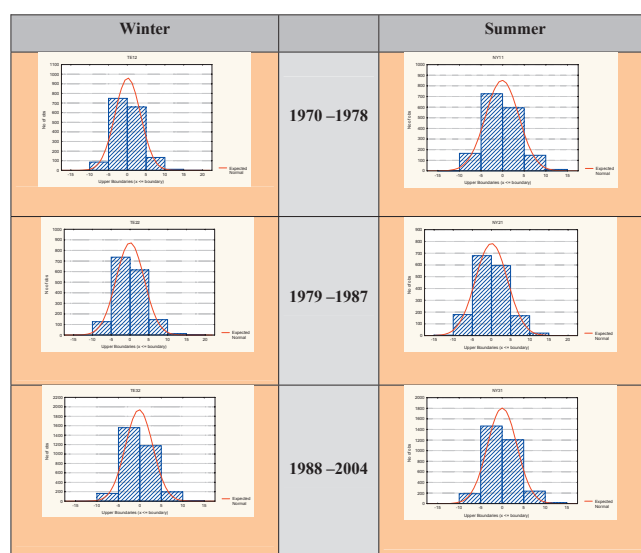


Figure 4 Histograms of the 3 period's 2 half years.

Social and economic originated trends and yearly curves will be used in the examination of the effects of circulation and primer front types. Before this, effects of some local meteorological parameters are studied in the context of daily suicides.

4. Local weather and suicide

Searching the role of weather in suicides, we chose daily mean temperature, humidity characteristics, cloudiness, wind speed and sunshine. Conditional averages were made in every month. Conditional averages meant that on the current day 1, 2, or 8 or more suicides happened. This survey used only the meteorological and suicide data of the middle of the country (Budapest and surroundings).

Humidity characteristics didn't show any relation to suicides in any month, so that we used only temperature, wind speed, cloudiness and sunshine duration as the function of suicides.

In certain months, i.e. in March and April with the increase of temperature slight tendency appeared. In winter (except February, where the effect is reversed) and in the spring months higher temperatures cause more suicides, while in summer no effect can be found. In autumn, increase is realised only in September.

Cloudiness and sunshine are thought to be complements of each other, but the results show more complicated association from the view of suicides (Figure 6.). Wind speed didn't indicate any connection with suicides (except spring and autumn months).

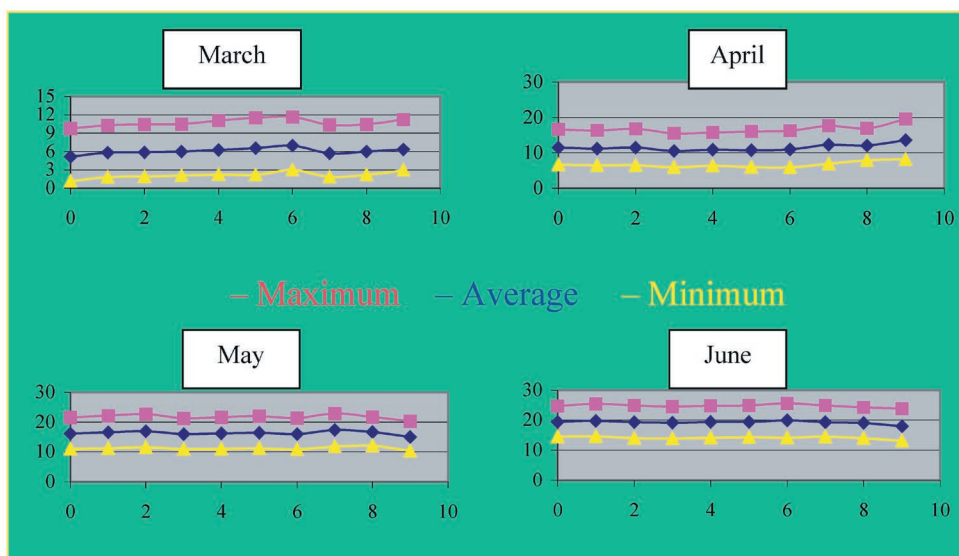


Figure 5 Conditional averages of early summer months (x=number of suicides, y=integral temperature in degrees)

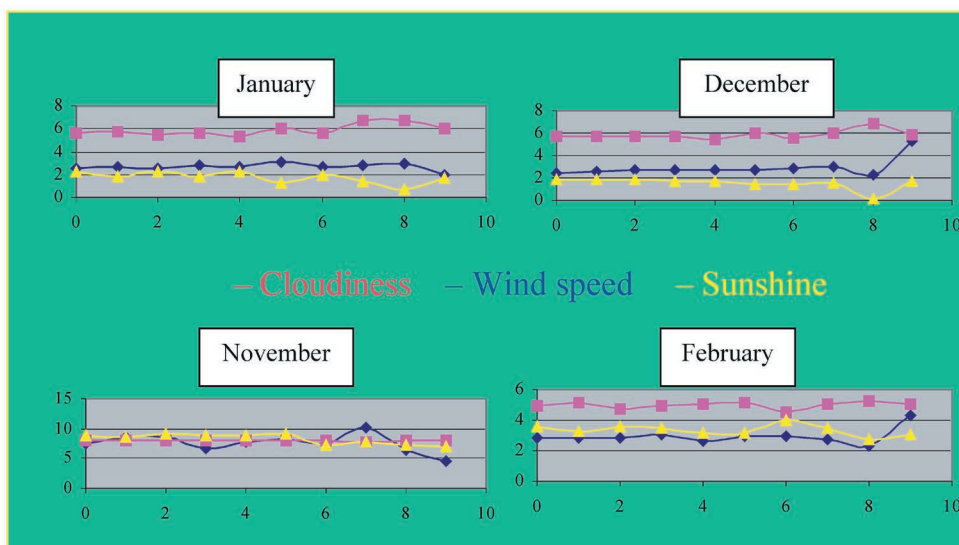


Figure 6 Effect of cloudiness (octas), sunshine (hours), wind speed (m/s) (Conditional averages)

5. Effects of synoptic situations

On the other hand, suicides were examined by Péczely synoptic scale weather types (Figure 7.). At this moment we used those filtered anomaly series, which were cleared from seasonality and trends and confront with the 13 synoptic types and front diary derived from these weather types (Figure 8).

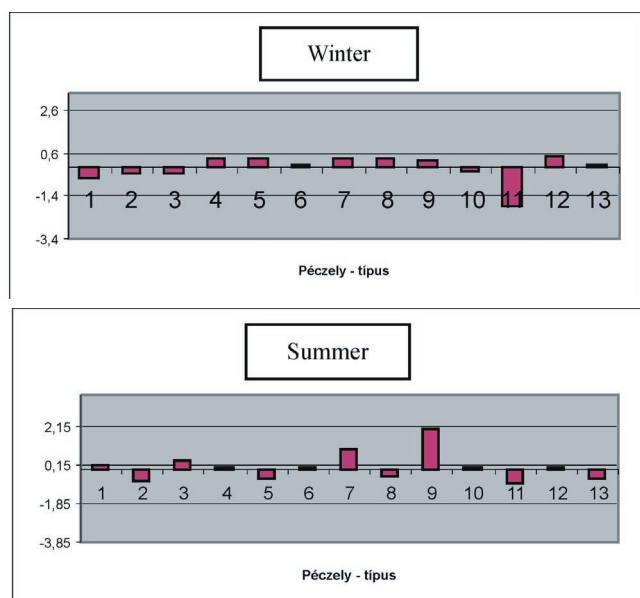


Figure 7 Effect of Péczely types in the two half years related to to the period's deviation

In the winter half-year in the 11th situation (anticyclone above Fenno-Scandinavian peninsula) has a decreasing effect, in the summer half, 7th (zonal cyclonal) and 9th (western anticyclone) has an increasing effect on suicides.

Then we analysed smaller systems on average surface maps and collected these Péczely types to a 5 type classification (Figure 8.). Our aim was a long term front diary which has the advantages and similarities as shown on Figure 9.

New	Met	Péczely	
1	anticyclon	5	Ae
		9	As
		10	An
		12	A
2	warmfront	6	CMw
3	both	4	mCw
		7	zC
		13	C
4	coldfront	1	mCc
		8	Aw
		11	AF
5	Back side	2	AB
		3	CMc

Figure 8 Closed up Péczely types

Unfortunately these new coupled smaller scale circulation types were not successful in dividing high and less suicide events than Péczely's types. In Figure 10. deviation of conditional averages of each 5 primer front types. In anticyclonic situations the frequency of events are the same as the average of the sample.

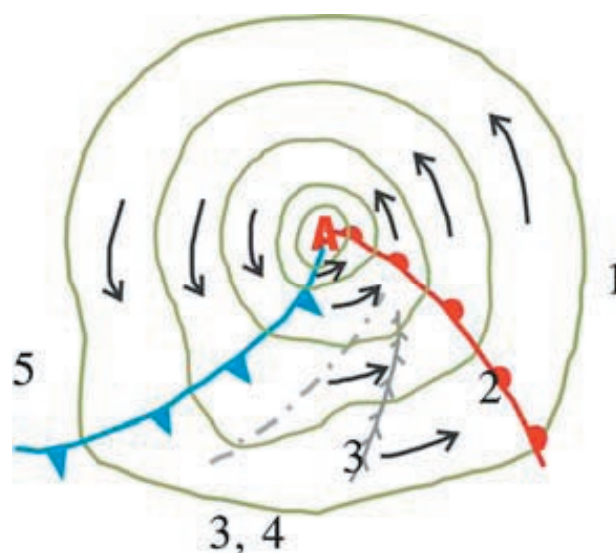


Figure 9 Front codes

Deviation of conditional averages from zero is not significant in any group. Only the back of cyclones has some decreasing effect on unfortunate events.

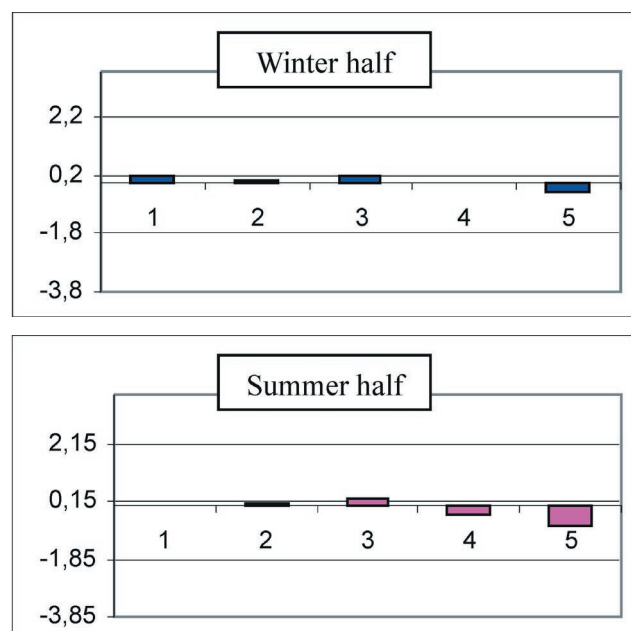


Figure 10 Effects of primer fronts according to standard deviation

6. Summary

In this research we found univocal trends in yearly suicides, so that the whole interval was divided to 3 periods. In each period well-defined yearly curves were analysed. Useful results were sketched in case of temperature and sunshine. Effect of other meteorological parameters are negligible.

After the review of frequently use weather circulation types, we chose Péczy circulation types and formed a new – convenient to search for frontal effects – primer front types. But with these methods we didn't find any practically useful and significant relation.

Before last consequences other surveys are needed.

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