A Computer-based Quality Control Program for Evidential Breath Analyzers ; a Finnish Model.

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Abstract

The computer-based quality control program for evidential breath analyzers (Alcotest 7110 MK III FIN) has been in use in Finland since July 1998. Eighty-five instruments have been placed at police stations in different regions of the country. Every instrument is connected to a personal computer (PC) with a specially designed program.

Every PC is further connected to a central computer of the police. The collected data is transferred daily to the National Public Health Institute (KTL). There, a specially designed program checks the incoming data. The data from each case is sent through this control system and a check and a recalculation of both technical and analytical data takes place.

The rest of the information related to the driving situation is weekly sent to KTL. This data forms the base for epidemiological statistics. KTL also analyses all the blood samples of drunken drivers in Finland. Therefore, it has the corresponding data from those blood samples too. The centralised system with breath samples makes it possible to analyse the whole material and to follow the situation of drunken driving in Finland as a whole.

Introduction

The statutory limits for breath alcohol concentration are 0.25 and 0.60 mg/l in Finland. This act came into force 1.9.1994. The parliament presumed that an appropriate system for quality control should be created. The Ministry of the Interior appointed a committee to carry out this project.

In 1995 a document was published by the committee concerning guidelines for evidential breath alcohol testing instruments to be used by the police in Finland (1). Also the means and methods to be used in testing the instruments were defined. The guidelines also stipulated, that the instrument should be used in connection with a personal computer (PC) at the police station. The PC was supposed to serve as a link between the instrument and a central database of the police. From this database it would be possible to send information forward for evaluation of the data.

Following a public procurement procedure and an evaluation of the tenders received, the committee chose a German device, Dräger. The name of the slightly modified model is

Dräger Alcotest 7110 MK III FIN. As an impartial institute, the National Public Health Institute (KTL) was assigned to perform the quality control.

In 1997 the formula for the so-called safety allowance was decided based on a test material consisting of about 500 measurements (2,3).

The Ministry of the Interior is in charge of the whole system. Additional co-operators are Nederlands Meetinstituut (initial verification of the instruments), Scott Speciality Gases (supplier of the calibration gas), Liitin Oy (import and service), SKL-Swedish National Laboratory of Forensic Science (checking of a.o. interfering substances) and VTT - Technical Research Centre of Finland (periodic verification).

Methods

The Finnish model for the network of the instruments and the computer-program is called HALMI, which is an abbreviation from the Finnish language about measuring breath alcohol concentration.
The part of the system used by the police is called HALMIO and the part used by KTL HALMILA (abbreviations from Finnish for control and quality control). Figure 1 gives an overview of the data management system.

The instruments are placed at police stations, usually one device for each jurisdictional district (85 devices altogether). In every district one specially trained policeman is in charge of the device. Additionally one trained police officer of higher rank in every province is in charge of all the devices within his province.

In the KTL part of the system, registers are recorded with base information about the instruments, the users and the calibration gas. The technical and analytical conditions for each actual breath alcohol measurement performed at the police stations are also recorded.

Every breath test produces two sequences of data. The first one is processed by the PC at the police station and, as a result, a document is given to the suspect. This data is then automatically sent forward to KTL. The second sequence is sent to KTL without any processing by the local PC. Every morning, the incoming data is transferred to the HALMILA program, which controls and calculates data from both sequences. An error message is produced, if a difference between the results from the two sequences is registered. In this case, feedback to the police officer in charge is given from KTL within a few days.

The HALMILA program controls e.g. the following data: calculation of the final result, ethanol value for the calibration gas, difference between the readings from the electrochemical and infrared chamber of the device, continuity, pressure, volume and time for the sample. A printout of the corresponding data as well as various technical data can be produced too.

Information about the operators as well as the epidemiological data relating to each drunken driving event is sent weekly to KTL. The results of the breath samples from suspects tested with an evidential breath analyzer are later combined with the results of the blood samples

from those who have given a blood sample. Statistics of drunken driving in Finland can thus be produced as a whole.

Results

1. Safety allowance (which is subtracted from the result in order to achieve the demanded level of security)

The material was collected from voluntary persons. Ten Dräger devices were used at different police stations. Totally 584 measurements were recorded. The mean breath alcohol concentration varied between 0.000 and 1.150 mg/l. The standard deviation was between 0.00434-0.03134 mg/l. The systematic error was calculated from the two values of the calibration gas in every measure sequence. The formula for the safety allowance is at the moment 0.04 + 0.08 x mean value of the two breath samples i.e. in only one case in a million, the final result used as evidence in a court of law could be higher than the actual.

2. Registered errors

Figure 2 gives an overview of the function of the devices during the period 1.1-30.9.1999. In totally 11714 measurements were made. They consist of both voluntary tests and actual measurements from suspects.

Registered errors 1.1.-31.12.1999

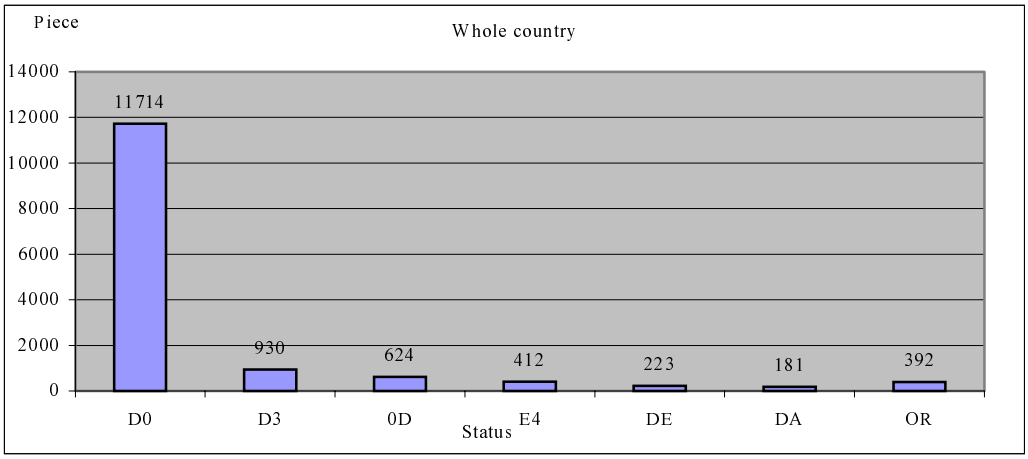

Figure 2

D0 = Complete and valid subject test
D3 = No cal cas
0D = User abort
E4 = Time of 1. Test different from time of 2. Test
DE = Readyness for blowing exceeded
DA = Result 1. Subject test different from result 2. Subject test
OR = Other reasons

3. Blood and breath alcohol distribution in drunken drivers during 1.1-30.9.1999

In Table 1 the distribution is presented according to the statutory limits for blood and breath in Finland. The utilisation rate of the evidential breath analysers is about 60% for the whole country. However, the rate in large towns is considerable higher. In Helsinki, where 4 devices are in use, the rate is about 80%.

Table 1: Distribution between breath and blood samples

mg/l o/oo	<0.25 <0.50	0.25- 0.50-	total
breath samples	1091	8639	9730 (59%)
blood samples	598	6244	6842 (41%)
total	1689	14883	16572

Conclusions

The entire system has proved to be both reliable and easy to use. The main causes of registered errors are due to either the suspect or the user of the instrument.

The safety allowance is higher for breath alcohol than for blood alcohol measurements. The same probability for false positives is used in both systems. The safety allowance for breath alcohol measurements will be recalculated in the near future, based on the large material now available.

References

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