Substance use at music festivals:

What is burning up the dance floor?

The project was supported by:
The Scientific Institute of Public Health (WIV-ISP) is the scientific reference in the field of public health. Through innovative research, analyses, monitoring activities and expert advice, we support health policy and policy-making. That way we contribute to a healthy life for all.
INTRODUCTION

The main mission of the Programme Drugs of the Scientific Institute for Public Health (WIV-ISP) is the collection and analysis of objective and reliable information with regard of all aspects on the illicit drug situation and drug addiction in Belgium. Knowledge gained through scientific research is put in use to support professionals and (inter)national policy makers in the development, implementation and evaluation of a comprehensive and integrated drug policy.

Due to the geographical setting and the open EU borders, Belgium is known to function as a transit country for trafficking of illicit substances to many other countries in Europe. The supply side of the drug market is monitored through a regular information exchange by the customs and police services. On the contrary, accurate and real-time information on the demand side of the market and trends in drug use is often lacking. In addition, the growing importance of internet trading for almost all consumer goods has created additional obstacles to obtain a clear view on the actual use and consumers' interest in illicit substances.

The main objective of this study was to map a snapshot of the drug situation (both demand and small scale supply) in nightlife setting by means of combining several research approaches. Music festivals have an important societal and economical value in Belgium, with party drug use known to be quite common.

A specific dance festival organised in 2015 in Belgium was selected as a setting for this study. Though several initiatives were already in force to estimate drug use at this event for some years, the collected information on the drug scene has always been too fragmented to provide a clear overview towards drug assistance, the event managers as well as the scientific community. The strength of the current action is highlighted in the close collaboration and interaction between different stakeholders involved to obtain an overview on the drug situation at the spot. Moreover, the results give rise to evidence-based information on drug use, the retail drug market and best practices with regards to drug monitoring in nightlife settings.

This report provides a short overview of the performed actions and mainly focuses on the resulting recommendations towards drug monitoring actions and risk management in nightlife settings.

We would like to emphasize our gratitude to all of the partners that have contributed to this project. Their input throughout the event as well as their efforts and recommendations afterwards were of great added value.
# Table of Contents

Research design ......................................................................................................................... 1  
Methodology & Results ............................................................................................................... 3  
PART I. Analytical screening of illicit drug samples ................................................................. 3  
PART II. Analytical screening of intoxications ............................................................................ 8  
PART III. Analytical screening of wastewater and ‘pooled urine’ ............................................ 12  
PART IV. Prevention initiatives .................................................................................................. 16  
PART V. Surveillance and the Early Warning System ............................................................... 20  
General discussion .................................................................................................................... 21  
References ................................................................................................................................ 24  
Annexes ..................................................................................................................................... 25
RESEARCH DESIGN

Getting an overview of the actual drug market remains a huge challenge. Several established research efforts based on survey methodology – such as the Belgian Health Interview Survey (Gisle & Demarest, 2014), student surveys (Rosiers et al., 2013) and party surveys (Rosiers, 2016) - are valuable sources of the on-going drug consumption in the Belgian (sub)population(s). While these initiatives provide estimations on drug consumption and related behaviour, the resulting information most often remains fragmented and incomplete. Therefore, complementary approaches are required to enable a better understanding of the information on illicit substances that remains under the radar. In addition, the ever-developing European drug market is becoming more and more complex due to the upcoming presence of New Psychoactive Substances (NPS).

Party (drug) surveys have shown that drug use is particularly popular in nightlife settings (Rosiers, 2016). Previous research at dance events in Belgium already provided insights on the drug consumption of party-goers seeking medical attention (Wille et al., 2014, Wille et al., 2014, Patteet et al., 2015, Sundahl et al., 2015, Calle et al., 2017). These earlier efforts successfully gave rise to the idea of installing a more holistic approach for mapping drug use and drug supply at the retail level in music festival settings.

This specific project was set up with a main focus on the identification of psychotropic party drugs being present at a large summer dance festival in 2015, as well as the determination of substances that led to (medical) problems for party-goers during the event.

CONCRETE RESEARCH OBJECTIVES:
- Identification of the (party)drugs which were present at a dance festival, with special attention to the new psychoactive substances through:
  o Analysis of seized synthetic psychoactive products
  o Analysis of bio-clinical samples of party-goers who requested medical support
  o Analysis of the wastewater of the festival area.
- Collection of qualitative data on the behaviour of festival-goers and their pattern of drug use.
- Risk assessment based on real-time identification of seizures and interactive communication on the separate data collections throughout the event.

Tomorrowland (TML) is currently the largest (dance) music festival in Belgium and even acquired a world-wide label of best dance festival in the world. Throughout the years, the TML organizers took the upper hand in meeting other stakeholders to work towards a general drug policy for festival events - including a ‘zero tolerance’ perspective. The festival management has supported the earlier monitoring activities organised by the Scientific Institute for Public Health (WIV-ISP) and facilitated the new approach of this project which
ensured a most accurate drug monitoring possible during the event’s edition of 2015, expected to have welcomed a total of 180,000 attendees.

The involvement of different partners and stakeholders (such as researchers, law enforcement, prevention services, medical posts, event managers, etc.) within this project by default implies multiple individual goals. At the same time, the added value in this project lies within the combination of the various but complementary (research) approaches, each providing information on a different aspect of the drug problem in nightlife settings.

For details on the practical part of the organization, we refer to the general research protocol\(^1\) that was created in order to coordinate and align the separate actions of the different stakeholders involved.

\(^1\) available on request.
METHODOLOGY & RESULTS

PART I. ANALYTICAL SCREENING OF ILICIT DRUG SAMPLES

Methods:
The TML festival and the camping ground hold a strict ‘zero tolerance policy on drugs’, meaning that it is forbidden to use, trade and/or possess any type of illicit drug at the event. Upon the detection of any substances, the festival-goer concerned is irrevocably removed from the festival area. Naturally, this approach requires a strict control system and frequently cases are handed over to the police enforcements.

An analytical screening of seized drugs samples on the festival area was performed in order to provide an answer to the following questions:
- What types of drugs are present at the festival?
- Are NPS present amongst these samples?
- What is the composition and quality of the drugs found?

Drug samples were collected through three different gateways:

I. SEIZURES BY THE POLICE

The local police enforcements provided the WIV-ISP of samples from every seizure that passed through their (prosecution) system during the event and were subject to a common police report or an amicable settlement. In other words, only those cases that were treated by the police for drug use were included, while cases on drug dealing were not. All samples were collected for handover to the WIV-ISP after the festival event. During the drawing of the statements and charge reports, every seizure was also photographed. These pictures were used as an additional support to assess the drug situation at each state by checking whether similar shapes or logos were already known by the Belgian Early Warning System on Drugs (BEWSD; for more information on this action, please refer to PART VI on surveillance).

II. AMNESTY BINS

Before entering the festival area, festival visitors received notice of a final possibility to get rid of any psychoactive substances in designated “drug drop tons”. These collection systems are called amnesty bins and were placed at the entrance zone of the festival in front of the main zone of security control. The barrels bore an indication of their purpose and were accompanied by guidelines on the fact that those that might still carry any substances on them before entering the security control could still deposit their drugs on a voluntary basis and with impunity. This approach has been used on other Belgian party events before, but is known for mixed results depending on the conversance of the action.
III. SAMPLES RECEIVED THROUGH THE MEDICAL SERVICES

Psychoactive substances are also often found on or handed over by patients that present themselves to the medical services. Within this project, The Flemish Cross transferred any found substances to the police enforcement so to also include these samples in the final batch of seizures for subsequent analytical screening by WIV-ISP.

At the moment of collection (actual seizure, clearing out the bins or hand-over by medical staff), the police took a photograph of the disposable samples so to provide the WIV-ISP of an overview of the collection. The samples were only handed over to WIV-ISP for analytical screening after the event for by the Medicines Laboratory.

In a first step, a triage was performed. As the main objective of this research was the identification of (new) synthetic substances, cannabis samples (both marihuana and hashish) were not withhold for further qualitative analysis and those samples were immediately destroyed.

After the weighting and measuring and depending on the nature of the products, the synthetic drug samples were crushed to obtain a powder or immediately dissolved in methanol for further analysis. In the case of liquid samples, sample preparation was performed using dichloromethane. These sample preparation steps were performed in a security cabinet. The obtained solution was ultra-sonicated and if necessary filtered before analysis. The samples were analysed using gas chromatography (type: Agilent technologies 7890A) hyphenated with a single quad mass spectrometer (type: Agilent technologies 5975)(GC-MS). When a signal was detected the mass spectrum was compared to different spectral libraries (NIST type libraries, Cayman library and some in house libraries). The compound was considered identified if a match is found above 85%. If a standard is available quantification will be performed using GC-MS, ultra violet analysis or liquid chromatography (LC).

Results:

The placed Amnesty Bins did not prove to be an efficient collecting system in this festival edition seeing that not a single valid drug samples could be obtained through this strategy. A possible explanation for this might be that the strategy is unknown to the - Belgian as well as international – visitors. After all, earlier experiences with this specific approach on other festive events have proven that a certain level of acquaintance with this strategy (as well as a certain level of thrust in it) is needed before the visitors tend to make use of it. Therefore, it might require several editions of the event applying this system before any results might be representative.

A total of 226 drug samples were collected during this event via seizures by the police and the products collected through the medical services, of which 225 drug samples were handed over for analytical screening after the event to the Medicines Laboratory at WIV-ISP. One drug sample caught special attention during the event and was handed over by the
police and the Prosecution Counsel for immediate identification. It concerned tablets that were found in a large amount but did not get recognized by any intervention of the drug dogs nor by the standard drug (colouring) tests used by the police. Assuming a potential presence of NPS, the Toxicological Centre of the University of Antwerp (UA) was appealed to for immediate analysis and attempt to identify the sample. Analysis by GC-MS pointed out that these particular tablets contained 4-fluoramphetamine (4-FA), a NPS already well-known for its MDMA-like psychoactive effects. This case clearly pointed out that the rise of new substances poses challenges for law enforcements with regards to detection, in addition to the difficulties for prosecution.

Remarkably, 2.7% of the collected samples were not identified as any psychoactive nor any other chemical substance. Amongst others, these samples concerned small rocks which might have been confused for potential drug crystals during the sample collection.

Figure 1: Drug seizures per type of drug format (%)

Analytical screening of all synthetic drug samples (N= 113) pointed out that the most frequent substance found was MDMA. Table 1 provides an overview of all psychoactive substances detected in the action. It comes to no surprise that no opioids were found among the analyses, since these have a sedative effect and party users usually tend to look for products that stimulate or enrich the experience of the party excitement. It is also remarkable that 12 tablets proved not to comprise any (psycho)active ingredients. For example, one specific pill seemed only to comprise wheat flour, but nevertheless, clearly some efforts have been put in the creation of the colour, shape and logo of the product to make it look like a party drug tablet. In addition, these “empty cases” often resemble other known ecstasy batches.
Table 1: List of all identified substances in the synthetic drug samples (powders and tablets)

<table>
<thead>
<tr>
<th>Detected Substances</th>
<th>Conventional Drugs</th>
<th>NPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamine</td>
<td></td>
<td>GHB</td>
</tr>
<tr>
<td>Cocaine</td>
<td></td>
<td>Ketamine</td>
</tr>
<tr>
<td>LSD</td>
<td></td>
<td>2H-indol-2-one,1-(2,6dichlorophenyl)-1,3</td>
</tr>
<tr>
<td>MDMA</td>
<td></td>
<td>2-pyrrolidinovalerophenone (α-PVP)</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td></td>
<td>4-fluoramphetamine (4-FA)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>4-fluoromethcathinone (Flephedrone, 4-FMC)</td>
</tr>
<tr>
<td>Caffeine</td>
<td></td>
<td>4-broom-2,5-dimethoxyfenethylamine (2C-B)</td>
</tr>
<tr>
<td>Diclofenac amide</td>
<td></td>
<td>Para-methoxy-amphetamine (PMA) / para-methoxy-methamphetamine (PMMA)</td>
</tr>
</tbody>
</table>

Several types of NPS were found and some even proved to be present in multiple samples, clearly indicating the rising popularity of this category of psychoactive substances. Nevertheless, all identified substances were already known and listed in the BEWSD library and hence no new types of NPS were detected.

Both Ketamine and Flephedrone, also known as 4-fluoromethcathinone (4-FMC), are substances that are already known for years, but now seem to have obtained an established place in the Belgian party drug scene. In addition, the about 10 collected Ketamine powder samples proved to be of very high quality.

Alpha-PVP is a synthetic cathinone and a potent psychostimulant, and is similar to MDPV. It has been available on the drug market in the European Union since at least February 2011 and has already been detected in all 28 current Member States.

4-FA is a synthetic cathinone with a desired psychoactive effect that is described as something in between the known effects of ecstasy and amphetamine. Users witness that upon use, they experience to have more energy, a reduced appetite, euphoria and the urge to move and talk a lot. Undesirable effects are the raised heart beat and corps’ temperature, tense jaws, nausea, headaches and anxiety. The use of 4-FA is known to be very popular in The Netherlands (Goosens et al., 2013).

PMMA and PMA are quite identical amphetamine-like derivatives with regard to chemical structure and physical effects. The consumption of a low dose is assumed to create an energetic and slight euphoric feeling, similar to ecstasy. In the past years, the substances have been encountered in ecstasy tablets – mixed with MDMA or sometimes even in a purer format. Many warnings have been sent on the appearance of these dangerous substances as the effects of PMMA and PMA are only noticed much later than MDMA upon consumption. In this scenario, even experienced users might assume to have taken low-dosed ecstasy pills, often resulting in the action of taking an additional tablet which hence leads to overdose. In addition, the difference in the amount/dose of PMMA or PMA which causes the desired psychoactive effects or causes an overdose is very small. Known
symptoms of overdose are nausea, irregular heartbeat or even heart attacks, respiratory difficulties, spasms, hyperthermia and fainting. Since 2010, many EWS services in Europe, including Belgium, have sent out alerts on tablets and powders containing PMMA (e.g. the Superman PMMA tablets, reported by the Dutch, UK, Spanish and Belgian EWS in the past years) and have reported on several notified deaths directly linked to the consumption of the substance.

For those samples comprising MDMA, a range of dose was found from 70.5 mg to a record amount of 238 mg MDMA base. More than half of the analysed samples (62%) contained more than 125 mg MDMA; 48% contained more than 175 mg; 24% more than 200 mg and 10% more than 225 mg MDMA base.

The detection of Diclofenac amide in one of the assumed ecstasy tablets is somewhat surprising as this is a potential prodrug of Diclofenac, a nonsteroidal anti-inflammatory drug (NSAID) taken or applied to reduce inflammation and as an analgesic reducing pain. The presence of Diclofenac amide in a party drug tablet again highlights the diversity of substances that is currently used in the production process of party drug pills, which might lead to a range of different (undesired) effects for those unaware of the exact content of their purchase.

**Conclusion:**

Upon analysis of the seized synthetic drugs, the most frequently detected substance clearly was MDMA, confirming the regained popularity and comeback of the party drug (EMCDDA, 2016). The results also confirm the presence of a large diversity of other substances in tablets assumed to be sold as ecstasy. Amongst these, several NPS were detected, thus indicating that these substances indeed gain a more and more vast stand in the party drug scene. Next to this, the results also confirm that more than half of the ecstasy products exceeded the threshold level of the Belgian Early Warning system on drugs (120 mg of MDMA base) and are therefore labelled as highly-dosed. It is striking that more than 24% of these tablets even exceeded a MDMA dose in which more than the double of the recommended amount of psychoactive ingredient (200mg of MDMA base) was present in the product and hence imposes a major health danger for the user.

Remarkably, many tablets were detected that did not contain any (psycho)active ingredients. A first thought on this might be the potential additional presence of still unknown – and therefore difficult to detect - novel psychoactive substances. However, this did not seem to be the case for any of these samples. Though it is not the scope of this study, these results allow us to speculate on the current drug market and the potential intentions and strategies of current drug suppliers. As most of these pills resemble other ecstasy batches by logo, colour or shape, this sets to believe that these “empty products” are created purely for the pursuit of profit.
PART II. ANALYTICAL SCREENING OF INTOXICATIONS

Methods:

People who need medical care will initially visit a medical post on the festival area. When an intravenous line (permanent access to the blood for any administration of medication) was judged to be necessary because of symptoms and signs of disease, a blood sample was also taken for further qualitative analysis. This procedure has been previously performed at another Belgian indoor EDM event (Calle et al, 2017) and applies to both alcohol poisoning as well as intoxications by illicit drugs.

The registration form used for eligible patients is included in Annex 1. An innovative aspect of this action lies in the blood sampling performed on the basis of an opting-out principle: the persons concerned received a letter (including an opting-out form) along with an indication of the possibility to obtain additional information on the past events and/or data from the study. The procedure was approved by the ethical committee of the University Hospital of Ghent.

In addition, the emergency units of the surrounding hospitals were addressed for complementing in this sampling procedure. These hospitals are likely to cover the treatment of party-goers that get to the hospital by their own efforts. In this way, these additional blood samples may contribute to the overall picture of this part of the project.

All blood were collected and stored in one batch by the Flemish Cross for transportation after the event to the University of Antwerp for analytical screening by GC-MS. In addition, several urine samples were collected but due to budget restrictions, these were not used for further analysis.

Results:

A total of 124 patients/blood samples were collected and eligible for further analysis. None of the patients opted out. All the samples originated from the Flemish Cross divisions at the festival area. Unfortunately, none were retrieved by the surrounding hospitals, though it is known that several intoxicated festival-goers were admitted. It is assumed that the instructions for sampling were not set as a priority by these hospital emergency units.

Alcohol

In 109 of 124 blood samples (87.9%) the presence of alcohol was confirmed. Figure 2 displays the range of alcohol levels that was found. A mean alcohol level of 2.01 g/l was detected and a median of 2.06 g/l. To put this in perspective: currently the legal limit for drinking and driving is set at 0.5 g/l.
Figure 2: Range, frequency and cumulative frequency of alcohol levels found in blood samples of intoxicated patients (%)

MDMA

In 66 of 124 blood samples (53%) the presence of MDMA was confirmed. Figure 3 displays the range of MDMA doses that was found in the plasma. A median MDMA level of 403 ng/ml was detected. Again, the threshold value in traffic drivers is much lower: it is defined for Belgium at 25 ng/ml.

Figure 3: Range, frequency and cumulative frequency of MDMA levels found in plasma samples of intoxicated patients (%)

MDMA concentration in plasma samples (ng/ml)
Amphetamines
In 9 of 124 blood samples (7%) the presence of amphetamines was confirmed. A range of 3 to 504 ng/ml and a rather low median level was detected (88 ng/ml). These analyses clearly emphasized the presence of polydrug use: 5 out of these 9 samples were also positively screened for MDMA, while another 2 samples showed a positive detection of cocaine. In only three cases (2.4%), the presence of methamphetamine was detected.

Cocaine
In 17 of the 124 blood samples (14%), the presence of cocaine (metabolites) was confirmed. In 6 of these 17 samples, only cocaine metabolites were found. This again indicates that in most cases, the use of cocaine is combined with other substances (polydrug use). For example, 6 samples in 17 showed the presence of cocaethylene metabolites next to the cocaine metabolites, indicating the combined use of alcohol and cocaine. Also, in 4 of the 17 samples, the substance ketamine was found.

Opiates
None of the blood samples indicated the presence of opiates, based on the screening for heroin metabolites 6-MAM and morphine. 1 blood sample showed the presence of codeine in combination with paracetamol, which is assumed as use of regular (legal) medication.

Other substances
Several other non-conventional psychoactive substances were detected through non-targeted screening, including some NPS. The most prominent observation was the notable presence of ketamine in 5.5% of the samples (7/124), with most of them indicating polydrug use: 6 in 7 (86%) also showed alcohol traces, 5 in 7 (71%) presented MDMA use, while 4 in 7 (57%) also detected cocaine metabolites. Furthermore, at least 2 presented traces of 4-FA, and also ethylone and alpha-PVP were detected in at least one case. Three cases (2.4%) showed the presence of PMMA. However, as the dosage of this substance was only detected in very low amounts, this might indicate that PMMA was present in the tablets as adulterant rather than an intended main drug type.

Finally, also traces of the use of several types of medication could be detected in the analyses, such as sildenafil, antidepressants and benzodiazepines.
Some rare cases were also labeled as ‘mystery cases’ since these could not be identified. Due to the lack of resources, no further screening on these substances was performed so far.

Conclusion:
The feedback coming from the medical teams indicated that the number of cases for whom an intervention was necessary was quite low in comparison to their experiences on previous summer events. This might be explained by the bad weather conditions of that time, as it is
assumed to influence the party mood of many and hence also the consumption pattern of the party-goers.

Although counterintuitive, our results point out that alcohol is clearly defined as the main culprit for the entry of people to the emergency services, followed by MDMDA and both often detected in very high concentrations. For MDMA, the high concentrations might partially be explained by the observed tendency of highly dosed pills and powders that are circulating on the Belgian drug market in the past years (BEWSD database, 2017). In addition, a striking observation is the prevalence of many poly-intoxications. Though most frequently encountered is the combination of alcohol and MDMA use, some of these cases also include a combination with another third substance and several cases of polydrug use did not include the consumption of alcohol. It is an observation of great concern as polydrug use often exponentially enlarges the potential health risks of illicit substances. For example: dehydration is a severe risk of MDMA use, of which the effect is strengthened by alcohol consumption. Moreover, the potential production of other psychoactive substances by the human metabolism in the case of polydrug consumption can also pose larger health risks than those related to the drugs that were consumed: the intoxicating effect of alcohol in combination with the stimulating effect of cocaine is popular among party people. Although both substances weaken each other’s individual effects, cocaethylene is created during the degradation of the two substances in the liver (also detected in some of the blood samples screened in this research). The effects of cocaethylene are similar to those of cocaine, but tend to be more intense and to work up to three times longer, though the toxicity is of a larger scale.

As the combination of alcohol and MDMA is clearly confirmed in our results, it gives proof that many MDMA users are still not aware or enough informed on the related health risks that comes with the use of this substance. Therefore, it is clear that prevention initiatives remain of great importance to correctly inform people on the health risks and best practice that come with drug consumption.

Most surprisingly, a notable number of ketamine intoxications were observed which supports the gaining popularity of this substance in the party scene. Also some other NPS cases were also identified, but despite the large number of NPS that are seized or found in the EU and Belgium each year (EMCDDA, 2017), NPS have caused very few problems and were not the main reason of cause for severe intoxications at this event. A point of attention is also that NPS use is often part of polydrug consumption, which makes it difficult to determine whether or not the detected NPS was responsible for any of the health implications of the patient. For certain substances however, this might certainly be presumed: e.g. In five of the cases that are presented in this study, alpha-PVP was the only substance detected. Alpha-PVP is a synthetic cathinone and a potent psycho-stimulant, detected already in 191 acute intoxications and 115 deaths throughout the EU. In 20% of these deaths, alpha-PVP was reported as either the cause of death or a contributor to death. Our results confirm this to be a NPS of concern.
PART III. ANALYTICAL SCREENING OF WASTEWATER AND ‘POOLED URINE’

Methods:

The third part of this project is based on the hypothesis that a human body excretes whatever it consumes.

The research unit of Prof. van Nuijs (University of Antwerp, UA) is specialized in this setup by analyzing wastewater that reflects the collective excretion of a large population of community. Wastewater analysis has demonstrated its potential as a complement to established monitoring tools in the drugs area. The analysis of excreted drug metabolites in wastewater is a powerful approach to get more insight on the types and quantities of drugs that are used within a certain area and to look at spatiotemporal trends. As the sewage system for this festival event was fully separated, this approach could be used for drug use screening on the whole festival population. In addition to the wastewater analysis, another technique has been established that involves the collection and analysis of pooled urine from stand-alone portable urinals and hence enables the analysis of a more specific setting or area and substances that are only present in lower concentrations.

Researchers form the UA were responsible for the sampling and daily transportation in ice boxes to the laboratory, to consequently store these samples at -20°C until further analyses by liquid chromatography coupled to quadrupole-time-of-flight mass spectrometry (LC-QTOFMS). For more details on wastewater approach and the analytical methodology used, we refer to (Van Nuijs et al. 2011, Kinya et al. 2015).

i. Wastewater analysis

The wastewater of the festival area was collected in large tanks, separated from any other kind of sewage system in the surroundings. The collection started on the first day of the event around 5 pm, when a first truck was loaded to carry of the first tanks volumes of that day. Two types of samples were collected:

i) A “composite sample” was collected each of the three event days, composing of a pool of 40 mL samples that were tapped from every truck that left the festival ground. In this way, a total of 3 “day samples were obtained.

ii) Every 2 hours, 200 mL was tapped from a large collection tank, resulting in a total of 10 ‘grab’ samples.
One important factor that needed to be taken into account for the calculations was the heavy rainfall during two of the three festival days which might have diluted the wastewater samples.

The wastewater of the camping ground was not included in this study, as the amount of samples collected was limited due to logistic obstacles.

ii. Pooled urine analysis

The collection of pooled urine samples was restricted to one specific urinal reservoir tank that was linked to male urinals located around the main stage of the festival. The samples were collected at different time points over the three consecutive days of the festival, resulting in a total of 7 samples comprising 20 mL each. A plastic tube connected to a 10 mL pipette was used to draw the sample from the tank. This specific collection tank was also disposed to the heavy rain fall during the event.
Results:

i. Wastewater analysis

Wastewater analysis confirmed the presence of several classical drug types and several new psychoactive substances, confirming their actual use during the festival (see Table 2).

Table 2: Identified substances in wastewater analysis.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Day 1</th>
<th>Timing Day2</th>
<th>Day3</th>
<th>Presence confirmed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocaine + metabolites</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>MDMA</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>MDA</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Ketamine + metabolites</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Alpha-PVP</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>4-fluoroamphetamine</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Ethylone</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Methiopropamine</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Methoxetamine</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
</tbody>
</table>

ii. Pooled urine analysis (Kinyua et al., 2016)

Analyses of the pooled urine samples also consistently confirmed the presence of several classical drug types (see Table 3): amphetamines, MDA, MDMA and cocaine. This suggests a significant use of these substances during the event. In addition, three NPS (4-fluoroamphetamine, alpha-PVP and ketamine) were also identified and confirmed using reference standards. The other detected compounds (NPS and metabolites) in samples were tentatively identified based on their accurate mass, structural elucidated productions. However, their identity could only be tentatively confirmed due to the lack of analytical reference standards, of which the purchase can be a costly process. Tentative identification can provide already some insight on relevant NPS, and was estimated to suffice in this study.

Table 3: Identified substances in pooled urine analysis.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Day 1</th>
<th>Timing Day2</th>
<th>Day3</th>
<th>Presence confirmed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocaine + metabolites</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>MDMA</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>MDA</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Ketamine</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>4-fluoroamphetamine</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Alpha-PVP</td>
<td>x</td>
<td></td>
<td></td>
<td>Confirmed</td>
</tr>
<tr>
<td>Alpha-PVP-metabolite</td>
<td>x</td>
<td></td>
<td></td>
<td>Tentative</td>
</tr>
<tr>
<td>AB-PINACA metabolite</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Tentative</td>
</tr>
<tr>
<td>4-fluoromethamfetamine</td>
<td>x</td>
<td></td>
<td></td>
<td>Tentative</td>
</tr>
<tr>
<td>N-acetyl-3,4-MDMC</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Tentative</td>
</tr>
</tbody>
</table>
The use of alpha-PVP at the festival became obvious by the detection of the parent and its tentatively identified metabolites, hence suggesting the popularity of this NPS. Ketamine also seemed to remain popular as evidenced by the detection of the parent compound in all samples.

**Conclusion:**

Wastewater analysis is a very powerful approach to collect information on substance use within a well-defined spatiotemporal setup. The applied method allowed a detailed screening of what compounds were used by the festival population. Even though the waste water samples were quite diluted as there had been much rainfall during the event, some striking conclusions could be made: As expected in a dance setting, stimulant use is very common. Next to the presence of several classical drug types, both approaches used for wastewater analysis support the presence of some types of NPS, such as alpha-PVP, 4-FA and ketamine, proving the actual use of these substances during the festival. Ketamine use has been around for several years, but it is only now that the use seems to increase in the party scene.
PART IV. PREVENTION INITIATIVES

i. Nightlife Survey:

Methods:

The research on trends in drug use in nightlife has already started in 2003 by partner VAD and ever since, their action is conducted every three years in clubs, dance-events and mainstream music festivals in Flanders. 5 researchers were also present at this festival to perform surveys on alcohol and drug use with 150 Flemish and 142 non-Flemish visitors. The distinction between these groups is based on the individual objectives of the VAD researchers: as they are a Flemish organization, their main focus is therefore to assemble information on the Flemish population. Each researcher received a list with guidelines in advance on the location, selection method, the materials needed and the agreements on the anonymity of the respondent. When researchers were in position, they requested passers-by to participate voluntarily. Upon acceptance, those people received a questionnaire, clipboard and pen to fill out the survey themselves. All surveys were conducted within a time frame of two to four hours. This concerns a random non-representative sample. The survey was also conducted on other Flemish festivals / dance events to enable the comparison of the results.

For further details on the methodology of this nightlife survey including the questionnaire, we refer to the published results on the action of 2015 (Rosiers, 2016).

Results:

For further details on the results of the general nightlife survey, we also refer to the published results on the action of 2015 (Rosiers, 2016).

With regard to this specific music festival event, the following results were found:

In total, 292 surveys were performed in which 17.2% of the visitors indicated that they had or intended to use drugs at the festival. One in three (5.5% of the total sample) had or would also combine several types of drugs (polydrug use, excluding alcohol).

Amongst the Flemish visitors, 6.0% and 2.0% indicated drug use and polydrug use respectively, while for non-Flemish visitors, the percentages were much higher: 30.3% and 9.2% respectively. This accounts for practically all types of drugs. (see “that day prevalence” in Table 4). Non-Flemish visitors tends to look for more harm reduction measures than Flemish visitors and seem to look more for information on their products. The indicated prevalence of drug use was lower than in clubs of nightlife (Rosiers, 2016). This is probably due to a more mainstream public.
The results indicate alcohol to remain the number one choice of drugs together with ecstasy. An observed rising presence of ketamine use, also confirmed in the blood and water analyses of part II and III, points towards an upcoming trend in nightlife settings.

The use of new psychoactive substances remains limited, though it is clear that certain products are present at the festival. Our results confirm the use and need of further monitoring in similar nightlife settings.

**Table 4: Prevalence of drug use (%) in 150 Flemish (F) and 142 non-Flemish (NF) questioned persons at the festival**

<table>
<thead>
<tr>
<th></th>
<th>Ever Use</th>
<th>Last year</th>
<th>1x / month or less</th>
<th>Multiple x / month</th>
<th>That day</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nationality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecstasy</td>
<td>10.1</td>
<td>17.9</td>
<td>8.7</td>
<td>18.6</td>
<td>8.7</td>
</tr>
<tr>
<td>Cocaine</td>
<td>8.0</td>
<td>10.6</td>
<td>4.7</td>
<td>13.3</td>
<td>4.0</td>
</tr>
<tr>
<td>Speed</td>
<td>8.0</td>
<td>8.5</td>
<td>2.0</td>
<td>6.3</td>
<td>2.0</td>
</tr>
<tr>
<td>GHB</td>
<td>5.4</td>
<td>3.6</td>
<td>0</td>
<td>1.4</td>
<td>0</td>
</tr>
<tr>
<td>Ketamine</td>
<td>3.3</td>
<td>4.3</td>
<td>0.7</td>
<td>2.1</td>
<td>0.7</td>
</tr>
<tr>
<td>NPS</td>
<td>6.7</td>
<td>5.6</td>
<td>2.0</td>
<td>2.1</td>
<td>0.7</td>
</tr>
</tbody>
</table>

**ii. Participant observation qualitative research:**

**Methods:**

The same researchers that were in charge of the Nightlife survey got instructions to participate to the festival while making observations of the festival venue, the visitors and the behavior of the visitors and crew while partying. Afterwards, a detailed, structured report was filed by each of the researchers to construct a full overview of perceived indications on the present drug use. In total, 11 reports were constructed throughout the three days lasting festival. VAD researchers summarized all observations in a separate overview report, providing some impressions on how fellow visitors might have perceived the overall drug use during a festival. Nevertheless, these results only display subjective impressions and hence must be interpreted with care.
**Results:**

Following highlights resulted from the participant observations:

**With regard to drug use:**

- Both cannabis and ecstasy are substances that are very easily to detect while other products are much harder to verify. The following drugs (used or dealing) were reported to be observed: cannabis, ecstasy, cocaine, speed, trip substances such as LSD, GHB and ketamine.

- In general, drug users (not taken alcohol use into account) seemed to be in the minority: during daytime there were very few indications of drug use while by nightfall the situation changed, especially around stages where techno, underground or hard house is scheduled.

- Though present, the action of dealing was also very little observed. The price for ecstasy tablets sold at the festival venue ranged from 10 to 20 EURO per tablet.

- There were very few indications of GHB use.

- Only few health incidents with drug users were observed at the festival venue. Several people were spotted with indications of health problems supposed to be linked to drug use other than alcohol. Most of these gave a confused impression, lacked any sense of balance. Those who were lying around with obvious need of help, were almost always quite immediately addressed by the collaborators of the medical care division.

- As indicated by the observations on previous editions of the festival and also on practically all other dance events in Flanders, the number one place for snorting use are the toilet cabins. Because of this, the organization took a special measure during this event by not providing any toilet seats, disabling users to use these seats for snorting lines of powders. It seemed that this measure might have had its wanted effect as – unlike on other events – little powder traces were found at the toilet cabins. Most remarkably, in addition, snorting in public (by the use of spoons or keys) was also very limitedly observed. Hence, these might be signs of a low prevalence of drug use by snorting administration.

**With regard to the entrance policy:**

- The control actions at the entrances were judged to be rather strict: Both police forces and trained drug dogs were present at both entrances, with exception of the crew entrance.

- The control posts at the camping grounds were less strict (less specialized forces), although controls by the use of trained drug dogs was also applied to the camping ground of the crew.

- There was a specific focus on checking for drug possession.
iii. People-oriented prevention and harm reduction: Safe 'n Sound peer support

Methods:

Prevention initiatives that are individual-oriented have a goal to inform festival-goers on the risks associated with drug use. To this end, the peer-to-peer project Safe ‘n Sound arranges information booths on both the festival and camping grounds. Young, voluntary peers are in contact with the festival-goers and work from a deterrent point of view while providing advice on getting the best out of nightlife in a safe, low-risk and wise way. In addition to product information (e.g. flyers, conversations, etc.), messages of the Early Warning System (BEWSD), clearly stating which harmful product have already been detected in Belgium, are distributed through these information booths. Furthermore, short surveys and quizzes are administered with visitors that get into contact with these information booths. Most people that are reached through this way of working are drug users, already with an intention to use at the spot, but also sensitized to obtain information in advance on the content of their products.

Results:

A total number of 294 interactions with visitors were registered at the information booths of Safe ‘n Sound.

Some observations from the peers working at these information booths:

- Most festival-goers were unfamiliar with this strategy of working, hence clearly skeptical and suspicious about the initiative in the starting phase of the festival. A clear positive evolution in this attitude was observed throughout the course of the event.

- Most questions on products applied to tablets that were bought at the festival grounds, before drug consumption but with clear intention to consume the drug at a later time after the contact with the information booth.

- Many visitors informed whether drug checking was possible at the festival. Also questions on the legal aspect of their products were very frequent.

- Most visitors indicated that they bought their products at the venue, rather than bringing these along themselves and smuggle them through the checkpoints.

Conclusion:

Prevention and harm reduction initiatives provided a different contribution of data collection on the drug problem present at the event. Next to a repressive drug policy approach, there clearly is an opportunity for actions of prevention and harm reduction at such an event.
PART V. SURVEILLANCE AND THE EARLY WARNING SYSTEM

**Methods:**

For the purpose of surveillance and risk analysis, the WIV-ISP researchers were provided access to the Emergency Control Center (ECC) of the festival. WIV-ISP was in charge for streamlining the communication between the single points of contact designated within each control component (police, medical posts, prevention, risk management of the festival organizer, etc.).

Next to this, WIV-ISP made an attempt for real-time monitoring of the drugs in circulation at the festival by the following approach: In advance, it was estimated that about 250 samples would be seized during the action. During the drawing of the statements and charge reports by the police enforcements, every seizure was also photographed. The pictures were only made for this purpose and were separated from the police files so that it would not hinder the prosecution of cases. These photographs were used as an additional support to assess the on-going drug situation by checking whether similar shapes or logos of other characteristics were already present in the Belgian Early Warning System database or other (e.g. literature, EDND database EMCDDA,…).

It is very important to emphasize that the identification of a product based on the outer appearances is just impossible. Therefore, this approach only provided an overview of assumptions on products that were seized. However, combined with other impressions of the police, prevention and medical services, it did proof to have a value for having a first general estimate of the presence of potentially dangerous products, mainly thanks to the constant commitment of all parties to exchange information among each other. The WIV-ISP approached the risk manager of the organization in two cases of shady products, for further discussion on whether or not to proceed in enhancing the actions on warning the audience for risks related to the use of these products.

**Results:**

Specific scientific results cannot be retrieved from this action.

Nevertheless, the opportunity to have had this festival as a “playground” for exploring on how to improve drug surveillance in a nightlife event is certainly worth discussing. This approach of providing a “central drug coordinating body” turned out to be highly appreciated by all parties. Up till now, this event (and most probably all similar ones in its kind) didn’t take into account the need of connecting all professional actors on the drug problem. A simple act of appointing a communication cell made a huge change in enabling the interaction and collaboration of actors of both the perspective of repression and prevention, as well as the event management. This type of multi-disciplinary consultation forms an important basis for real-time drug monitoring.
GENERAL DISCUSSION

Multiple drug monitoring approaches were performed during one single dance event to determine the minimum requirements for risk management with regards to the drug problem in nightlife settings.

The overall picture cannot be obtained by one single specific approach as each separate action only highlights a partial aspect of the drug phenomenon: Whereas the composition of drug samples and wastewater analysis provide some knowledge of the main classes of used substances and related purity levels, these cannot be of use for any conclusions about prevalence, frequency of use or the most common routes of administration. On the other hand, the conducted nightlife survey does provide information on the latter, but then again cannot add anything on the toxicological effects, caused harms or supply side of the drug market. Triangulating the outcome of different approaches is challenging but recommended to obtain a realistic insight on the types, quantities and related consequences of psychoactive substances that are circulating within a certain area of interest.

A remarkable outcome of this project is that the results of each separated research approach were very similar, hence all confirming following main conclusions:

A. The two main substances used at the festival were alcohol and MDMA. Though NPS seem to gain in popularity in Europe as well as in Belgium throughout the years (EMCDDA, 2017), the use of NPS within this setting proved limited. Ketamine – a well-known new psychoactive substance that already dates back to the 1980s and 1990s – definitely seems to be the upcoming psychoactive substance within the Belgian party scene and this trend should be carefully monitored in the future.

B. Most drug-related incidents during this event were due to the use of a combination of substances, with once again a mix of alcohol and MDMA as a leading cause for users to request medical aid. Prevention initiatives remain of great importance to correctly inform people on the health risks and best practice that come with polydrug consumption.

Based on our results, additional concerns are expressed on the current MDMA market: in more than half of the analysed MDMA-containing products collected during this event, the so-called recommended concentration of MDMA was exceeded. This is in line with the trends observed by the Belgian Early Warning System throughout the past years (Plettinckx et al., 2016). Naturally, consumption of these very potent ecstasy products includes a higher risk for overdose, especially when people are not aware of the composition of their product. Next to polydrug use, it is assumed that this ‘consumption without reflection’ is one of the largest threats with regards to drug use on events when applying a rather repressive drug policy. After all, results of both the participant observation study and the peer support initiative confirmed that many visitors testified (on the intention) to buy illicit drugs at the festival venue – not just because they are offered it, but mainly due to the rigorous security check and the rare and therefore highly desired festival tickets.
From a point of view of the actors on drug repression, it is a welcomed positive signal that most visitors do not dare to risk the smuggling of substances into the festival venue. It is however a clear point of attention for risk managers to be aware that such zero tolerance drug policy also implies a larger task for prevention and harm reduction services.

Recommendations towards an event drug policy

An innovative aspect of this study included the collaboration and fine-tuning between all professional services that are involved with drugs specimen or drug users during this festival. Though this might seems as just an obvious concept, harmonization of actions between different stakeholders (e.g. justice versus public health) is hardly ever the case: every participating stakeholder had already developed a well-established internal organization of their work at this setting in the past years, but structured interaction and umbrella coordination was previously not installed. To our knowledge, this is the first time that actors working from a perspective of repression, harm reduction as well as health care collaborated in a central drug information exchange system at a nightlife event in Belgium. Positive feedback of all partners clearly states that a zero tolerance policy is not at odds with the provision of initiatives on harm reduction as both parties may profit from such collaboration. We define a need for a general ‘event drugs strategy and action plan’ that envisions the mutual strengthening, rather than the competitive aspect of these separate approaches in the drug field. Such a general event drug policy, taking into account a continuum of repression of the drug supply and the care and monitoring actions towards the users, does not exist in Belgium so far. This report provides several elements that can be the basis to discuss best practice for future festive events.

Recommendations towards drug monitoring

In the light of working towards the structural monitoring of the Belgian drug phenomenon, one remaining question is whether similar monitoring/research initiatives should be repeated in the future? First, though this strategy provided both researchers and event managers with the best indications on the on-going situation, an extension of this project to multiple other festive events would be very labour-intensive and costly. The results of this report clearly point out that the different analytical approaches resulted in similar conclusions. Hence, it can be expected that it isn’t necessary to apply all mentioned procedures of this study in order to obtain a realistic impression of the drug situation at a nightlife event. Second, even with so many approaches applied, the results of certain actions will always just result in a snapshot of a certain sampling. This kind of data is of great value, but might not be enough to inform and support policy making. However, this study provides a model concerning data collection and data exchange and emphasizes the need for triangulation of data available from the daily professional services in Belgium working in drug-related repression, harm reduction and health care. Currently, the monitoring of police and customs’ information on drug supply is already well-established by the Reitox national focal point (at WIV-ISP). Moreover, the Early Warning System of this national focal point is in close contact with the professionals of harm reduction facilities to
provide them with information on appearing dangerous substances. In order to reflect the approach of this festival project, the only missing player at this moment is the emergency services in Belgian hospitals, for which reporting to the national focal point is currently not yet in place. To enable a complete and updated overview of the Belgian drug situation, best practice for emergency services should include:

i) information exchange with the national focal point on a regular basis on drug-related cases (symptoms, diagnosis, treatment, outcome/follow-up);

ii) enabling the analysis of the composition of drug specimen given by or found on patients and that are potentially related to the patients’ symptoms. Information should be reported to the national EWS;

iii) enabling the analysis of bio-clinical samples of patients with severe drug intoxication for further toxicological screening. Information should be reported to the national EWS.
REFERENCES


GISLE L, DEMAREST S (Ed.).(2014) Gezondheidse enquête 2013, Rapport 2: Gezondheidsgegevens en leefstijl, samenvatting van de onderzoekresultaten. WIV-ISP, Brussel


24.


ANNEXES

Annex 1 – Registration form used for blood sample collection at the medical services of the Flemish Cross
## Annex 1

Registration form used for blood sample collection at the medical services of the Flemish Cross

### Identification

<table>
<thead>
<tr>
<th>RK series number:</th>
<th>☐ ☐ ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender:</td>
<td>Male / Female</td>
</tr>
<tr>
<td>Age:</td>
<td>☐ ☐</td>
</tr>
<tr>
<td>Timing arrival at medical post:</td>
<td>☐ ☐ h ☐ ☐</td>
</tr>
</tbody>
</table>

### Symptoms at the timing of collection of blood

#### A. Neurological

<table>
<thead>
<tr>
<th>Pupils:</th>
<th>☐ normal</th>
<th>☐ mydriasis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐ miosis</td>
<td>☐ anisocoria</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consciousness:</th>
<th>☐ alert / awake</th>
<th>☐ hallucinations without hyperkinesis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐ drowsy / sleepy / slow</td>
<td>☐ milde hyperkinesis</td>
</tr>
<tr>
<td></td>
<td>☐ subcoma / easy to wake up</td>
<td>☐ severe hyperkinesis</td>
</tr>
<tr>
<td></td>
<td>☐ subcoma / difficult to wake up</td>
<td>☐ mix of (sub)coma and agitation</td>
</tr>
<tr>
<td></td>
<td>☐ coma / not possible to wake up</td>
<td>☐ agressive / agitation</td>
</tr>
</tbody>
</table>

#### B. Haemodynamics

<table>
<thead>
<tr>
<th>Systolic blood pressure:</th>
<th>☐ ☐ ☐ mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart beat:</td>
<td>☐ ☐ ☐ bpm</td>
</tr>
</tbody>
</table>

#### C. Respiratory symptoms

<table>
<thead>
<tr>
<th>Frequency:</th>
<th>☐ normal</th>
<th>☐ Bradypnea (&lt;10/min)</th>
<th>☐ Tachypnea (&gt;20/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturation without administration of O₂:</td>
<td>☐ ☐ ☐ %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Annex 1**

Registration form used for blood sample collection at the medical services of the Flemish Cross

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### D. Varia

- **Temperature:** ☐☐, ☐ °C
- **Glycaemia:** ☐☐☐ mg/dL

**Other symptoms:**

- ☐ headache
- ☐ convulsions
- ☐ chest pain
- ☐ vomiting
- ☐ cardiac arrhythmia / palpitations
- ☐ fainting
- ☐ stomach ache

**Please specify:**

---

### Assumed party drug? + How was this info obtained?

---

### Urine specimen

- **Collection in medical post?** Yes / No

**Timing of collection:** ☐☐ h ☐☐

---

### Further course of events

- **discharge Medical post:** ☐☐ h ☐☐

**total time spent in medical post:** ☐☐☐ min

**Destination:** ☐ home / back to the event ☐ hospital for further care

---

**Please describe the condition of the patient at the timing of discharge or when staying >2h at the post (include time indication)**