Using Google Analytics as a process evaluation method for Internet-delivered interventions: an example on sexual health

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SUMMARY
The study aimed to demonstrate the potential of Google Analytics as a process evaluation method for Internet-delivered interventions, using a website about sexual health as an example. This study reports visitors’ behavior until 21 months after the release of the website (March 2009–December 2010). In total, there were 850,895 visitors with an average total visiting time (i.e. dose) of 5:07 min. Google Analytics provided data to answer three key questions in terms of process evaluation of an Internet-delivered intervention: (i) How do visitors behave?; (ii) Where do visitors come from? and (iii) What content are visitors exposed to? This real-life example demonstrated the potential of Google Analytics as a method to be used in a process evaluation of Internet-delivered interventions. This is highly relevant given the current expansion of these interventions within the field of health promotion.

Key words: internet-delivered intervention; process evaluation method; exposure; website

INTRODUCTION
The Internet holds the promise of reaching large numbers of people and is very suitable to deliver interventions aimed at health promotion (Bernhardt and Hubley, 2001). A meta-analysis (Portnoy et al., 2008) and systematic reviews (Vandelanotte et al., 2007; Myung et al., 2009; Neville et al., 2009) indicate that Internet-delivered interventions can be effective in changing behavior, even in comparison with face-to-face interventions (Steele et al., 2009). Individuals, however, need to be exposed to the intervention content, through use of the intervention, to establish desired intervention outcomes (McGuire, 1985). Process evaluation aims to disentangle the factors that ensure successful intervention outcomes and attempts to document the steps involved in achieving successful implementation of an intervention. Integrating both qualitative and quantitative methods during process evaluation yields rich detail about intervention outcomes that neither method could achieve alone (Linnan and Steckler, 2002). Therefore, quantitative methods are needed besides qualitative methods such as structured observations or in-depth interviews. This study focuses on a quantitative method that can be used during process evaluation of Internet-delivered interventions: assessment of exposure using Google Analytics.

Exposure can be assessed objectively by tracking visitors’ behavior at Internet-delivered interventions. In contrast to self-reported exposure measures, tracking visitors’ behavior is independent of visitors’ memory, interpretation.
or social desirability (Crutzen and Göritz, 2010, 2011). Previous studies indicated the usefulness of investigating visitors’ behavior: this provided detailed insight into where visitors either leave the intervention website or have come to a standstill. This can be used to adapt interventions to visitors’ needs and thereby increase exposure and probability of positive intervention outcomes (Barak and Fisher, 2003; Lou et al., 2006; Patten et al., 2007; Roberto et al., 2007). Furthermore, it provides insight into how intensively visitors use the intervention (e.g. frequency and duration) and what they are interested in (e.g. topics; Crutzen et al., 2011b).

Despite these advantages, it is not common practice to track visitors’ behavior at Internet-delivered interventions (Brouwer et al., 2011; Crutzen et al., 2011a). It is important to realize this from the start of an intervention development process and to involve technical staff during this initial phase (Crutzen et al., 2009a). There are several ways in which visitors’ behavior can be tracked, for example by programming code as part of the development process or by using available services that are offered by third parties (Nakatani and Chuang, 2011). Google Analytics belongs to the latter category and is a sophisticated and free service offered to track visitors’ behavior (Dyrli, 2006). Technically speaking, it can be very easily implemented by inserting code into each webpage to be tracked [Clifton (2010) can be used as a manual]. Previous studies demonstrated its possibilities in providing detailed insight into use of a tourism website (Plaza, 2011) and the usability evaluation of e-commerce websites (Hasan et al., 2009).

The aim of this study was to demonstrate the potential of Google Analytics as a process evaluation method for Internet-delivered interventions, using Sense as an example. Sense (www.sense.info) is developed by the national institute for STI (sexually transmitted infection) and AIDS (acquired immune deficiency syndrome) Control in the Netherlands and aims to provide reliable information—for adolescents and young adults—about sexuality, but also being in love, relationships and issues that come with this. The overarching theme is that sex is a volitional choice; people should know their own wishes and set their own boundaries taking into account possible risks (e.g. sexually transmitted diseases, unwanted pregnancy).

**METHODS**

Google Analytics was implemented during the development process of Sense. This provided the opportunity to track visitors’ behavior as of the intervention’s release (23 March 2009). This study reports the data until 21 months after the release (23 December 2010). Before going into detail with regard to these data, the terminology used by Google Analytics will be explained using its own website structure.

Those who have access to the data (e.g. intervention developers, technical staff—secured by a user name and password) arrive firstly at the so-called dashboard. This provides general data (e.g. visits, average time on website) on visitors’ behavior. Furthermore, the dashboard provides the opportunity to select certain date ranges (e.g. last year’s visitors’ behavior) and to make comparison between date ranges (e.g. comparing this month’s visitors’ behavior with last month’s). Google Analytics consists of three submenus that are of key interest to the study at hand: visitors, traffic sources and content.

**Visitors**

Besides a technical profile of the visitors (e.g. browser, connection speed), the visitors’ submenu is especially relevant in terms of how visitors behave. The bounce rate, for example, refers to the percentage of single-page visits (e.g. visits in which the visitor left from the home page). Other aspects are visitor loyalty (i.e. count of visits from each visitor including current), visitor recency (i.e. when the previous visit was tracked) and depth of visit (i.e. pageviews in the visit). It is important to know that Google Analytics defines visits as the number of times visitors have been to your website (unique sessions initiated by all visitors). If a visitor is inactive for 30 min or more, any future activity is attributed to a new session. Visitors that leave and return within 30 min are counted as part of the original session. The initial session by a visitor is considered to be an additional visit and an additional visitor. Any future sessions from the same visitor are counted as additional visits, but not as additional visitors.

**Traffic sources**

The traffic sources submenu focuses on where visitors come from. There are three main
categories: direct traffic (i.e. directly to the website), referring websites (i.e. through links at other websites) and search engines (i.e. after a search engine query). Furthermore, this can be broken down per referring website and per keyword used in search engines. Finally, visitors’ behavior can be associated with traffic sources to investigate possible differences.

Content
The content submenu focuses on what content visitors are exposed to. This does not only give insight into the most popular content, but also on entrances (i.e. the number of times a particular page served as an entrance to the website) and exits (i.e. the number of times a particular page was the last one viewed by visitors). Visitors’ behavior can again be associated with the content of the website.

In sum, Google Analytics provides data to answer three key questions in terms of process evaluation of an Internet-delivered intervention: (i) how do visitors behave?; (ii) where do visitors come from? and (iii) what content are visitors exposed to? These three questions will be used to describe the results of using Google Analytics as a process evaluation method for Internet-delivered interventions, using Sense as an example.

RESULTS
In the 21 months after the release of Sense, there were 1,052,141 visits resulting in 6,851,377 pageviews (hence, 6.5 pages/visit). Of these, 80.4% were new visits and the average duration of these visits was 4:08 min. In total, there were 850,895 visitors with an average total visiting time (i.e. dose) of 5:07 min.

How do visitors behave?
The bounce rate is 32.9%, indicating that these visitors leave the website directly from the home page. Although this bounce rate is quite low in comparison with other Internet-delivered interventions [e.g. 56.3% in an intervention promoting heart-healthy behaviors (Brouwer et al., 2010)], it demonstrates the importance of the first impression which has a long-lasting effect on website use (Lindgaard et al., 2006). In terms of visitor loyalty, 80.7% visited the website only one time, 10.4% two times and 3.4% three times. Of the returning visitors within a month, 49.7% returned the same day, 28.0% within a week and 22.3% within a month. Another aspect of visitors’ behavior that deserves further attention is the depth of visit as indicated by the pageviews in the visit. On average, as described above, each visit comprised 6.5 pageviews. Figure 1 indicates, however, that the number of pageviews in the visit is not normally distributed. A small percentage of visits with great depth have a significant impact on the average, while most visits comprised three of fewer pageviews. The next step would be to link depth of visit to visitors’ characteristics. A previous study, for example, revealed that adolescents with a high intention to start smoking and to drink more alcohol (i.e. changing in an unhealthy way) chose greater exposure to an Internet-delivered intervention aimed at multiple health behaviors. With regard to physical activity and fruit consumption (i.e. changing in a healthy way), those who had a higher intention to be more physically active and to eat more fruit, chose greater exposure to the intervention. This should be taken into account during further development of such an intervention (Crutzen et al., 2008).

Where do visitors come from?
Direct traffic led to 27.9% of the visits, referring websites to 22.4% and search engines to 49.7%. This stresses once again that search engine marketing is critical in terms of attracting visitors to a website, but also demonstrates the importance of (cross-media) promotion of an Internet-delivered intervention through other channels [e.g. word-of-mouth (Crutzen et al., 2009b)], since direct traffic (e.g. people typing in the
Visitors’ behavior can also be associated with the keywords used in search engine queries (Table 2). These keywords were, not surprisingly given the topic of the intervention, sex-related. An exception was the intervention’s name (i.e. Sense) being used as a keyword in search engine queries. Interestingly, visits that came through this keyword led to more exposure (in terms of pages/visit and average time on website), fewer new visits and a lower bounce rate. An explanation could be that visits through the keyword ‘sense’ represent visitors that are looking specifically for the intervention that is being used as an example in this study. Therefore, these visits could be seen as direct traffic as well. This is different from visits through other keywords, which may represent visitors that are looking for information about a certain topic and are not necessarily interested in the intervention itself.

**DISCUSSION**

This study used a real-life example of an Internet-delivered intervention about sexual health to clearly demonstrate the potential of Google Analytics as a process evaluation tool. It is important to note that this is not a randomized controlled trial, but rather a real-world example that highlights the utility of using analytics in this context. The study found that visits from direct traffic (i.e., not through search engines) resulted in slightly higher exposure and average duration compared to visits from search engines. This suggests that direct traffic is more likely to result in deeper engagement with the website. Additionally, the study identified three referring websites that were responsible for slightly over half of the visits. These websites were all related to sexuality, which is not surprising given the topic of the intervention. However, the study also found differences in terms of visitors’ behavior, with the third-ranked referring website resulting in fewer visits but more exposure, fewer new visits, and a lower bounce rate. These findings can inform decisions regarding the promotion strategy of the intervention, as well as the content that is most relevant to visitors who came through these websites.

**Table 1:** Visitors’ behavior associated with referring websites

<table>
<thead>
<tr>
<th>Referring website</th>
<th>Visits</th>
<th>Pages/visit</th>
<th>Average time on website</th>
<th>% New visits</th>
<th>Bounce rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>vagina.startpagina.nl</td>
<td>44,621</td>
<td>4.6</td>
<td>3:02</td>
<td>81.2</td>
<td>30.5</td>
</tr>
<tr>
<td>penis.startpagina.nl</td>
<td>10,260</td>
<td>5.3</td>
<td>2:47</td>
<td>81.3</td>
<td>30.2</td>
</tr>
<tr>
<td>seksualiteit.nl</td>
<td>9,533</td>
<td>10.3</td>
<td>6:36</td>
<td>73.4</td>
<td>13.6</td>
</tr>
</tbody>
</table>

**Table 2:** Visitors’ behavior associated with keywords used in search engine queries

<table>
<thead>
<tr>
<th>Keyword [translation]</th>
<th>Visits</th>
<th>Pages/visit</th>
<th>Average time on website</th>
<th>% New visits</th>
<th>Bounce rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pijpen [blow]</td>
<td>47,207</td>
<td>4.1</td>
<td>2:22</td>
<td>84.5</td>
<td>47.4</td>
</tr>
<tr>
<td>sense</td>
<td>46,828</td>
<td>9.7</td>
<td>6:21</td>
<td>62.3</td>
<td>13.6</td>
</tr>
<tr>
<td>klaarkomen [come]</td>
<td>31,560</td>
<td>4.7</td>
<td>2:55</td>
<td>83.1</td>
<td>37.5</td>
</tr>
<tr>
<td>beffen [cunnilingus]</td>
<td>24,106</td>
<td>3.9</td>
<td>2:09</td>
<td>82.2</td>
<td>50.3</td>
</tr>
<tr>
<td>borsten [breasts]</td>
<td>16,562</td>
<td>4.9</td>
<td>2:07</td>
<td>84.7</td>
<td>44.1</td>
</tr>
</tbody>
</table>
method. An important issue to remember is what Kaushik (Kaushik, 2007) defines as the 10/90 rule: only 10% of information consists of data, the other 90% are human resources that are needed to interpret data so they can become valuable information. The data provided by Google Analytics need to be interpreted, for example by linking it to additional data obtained through other process evaluation methods (e.g. qualitative methods as described in the Introduction section). Google Analytics reveals, for example, what pages are visited and the frequency and duration of visits, but they do not reveal why visitors behave as such (Couper et al., 2010). Therefore, these metrics need to be augmented by further investigation involving actual users of an Internet-delivered intervention (Hasan et al., 2009). For example, visitors can leave because they found the information they were looking for and there is no need for them to stay. It could also be, however, that visitors are not satisfied with the Internet-delivered intervention as such (e.g. because they do not find the information they are looking for), which prevents them from staying. In-depth interviews can shed more light on this by asking visitors explicitly what they were looking for and whether they found this. To shed more light on how visitors find information, it is valuable to use think aloud interviewing. This method requires participants to engage in a specific task (e.g. search information about emergency contraception) and express the thoughts going through their minds as they search for this information. It is a non-directive technique, such that the only probe used after initial instructions is when participants stop verbalizing for some time, at which point they are reminded to think aloud (Eveland and Dunwoody, 2000). In that sense, the field of health promotion could learn from the field marketing in which the use of so-called ‘web analytics’ is much more sophisticated (Burby and Atchison, 2007; Jackson, 2009).

Google Analytics is not merely a process evaluation method, but also can be used to increase evidence-based insight into effectiveness of strategies aimed at improving exposure to Internet-delivered interventions, which is highly needed (Crutzen et al., 2011a). Even if such strategies are immediately applied in practice (i.e. in vivo) instead of pre-tested in a laboratory-based experimental setting (i.e. in vitro), there are appropriate designs, such as a time series design (Murry et al., 1993; Chen et al., 2005), to test effectiveness of these strategies. For example, two differently designed homepages can be implemented for a certain time period and intervention use can be monitored by Google Analytics during the whole period to determine which homepage is most effective. It is imaginable, for example, that there are differences in bounce rates between differently designed homepages. Although a time series design is more sensitive to confounding effects (e.g. changing environment) in comparison with laboratory-based experimental research, strategies are tested in a less isolated

<table>
<thead>
<tr>
<th>Page</th>
<th>Topic</th>
<th>Entrances</th>
<th>Bounces</th>
<th>Bounce rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>/(home page)</td>
<td>Home page</td>
<td>454 508</td>
<td>83 704</td>
<td>18.42</td>
</tr>
<tr>
<td>/vrijen/vrijen/klaarkomen-meisje/</td>
<td>Come—girl</td>
<td>59 665</td>
<td>20 754</td>
<td>34.78</td>
</tr>
<tr>
<td>/vrijen/vrijen/pijpen/</td>
<td>Blow</td>
<td>51 322</td>
<td>24 517</td>
<td>47.77</td>
</tr>
<tr>
<td>/vrijen/vrijen/beffen/</td>
<td>Cunnilingus</td>
<td>34 521</td>
<td>16 273</td>
<td>47.14</td>
</tr>
<tr>
<td>/meisjeslichaam/vagina-en-meer/</td>
<td>Vagina</td>
<td>20 729</td>
<td>77 54</td>
<td>37.41</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page</th>
<th>Topic</th>
<th>Exits</th>
<th>Pageviews</th>
<th>% Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>/(home page)</td>
<td>Home page</td>
<td>126 551</td>
<td>615 206</td>
<td>20.57</td>
</tr>
<tr>
<td>/ontdek-je-lichaam/</td>
<td>Explore your body</td>
<td>106 541</td>
<td>421 254</td>
<td>25.29</td>
</tr>
<tr>
<td>/vrijen/vrijen/pijpen/</td>
<td>Blow</td>
<td>41 305</td>
<td>111 647</td>
<td>37.00</td>
</tr>
<tr>
<td>/vrijen/vrijen/klaarkomen-meisje/</td>
<td>Come—girl</td>
<td>38 280</td>
<td>134 466</td>
<td>28.47</td>
</tr>
<tr>
<td>/vrijen/vrijen/beffen/</td>
<td>Cunnilingus</td>
<td>28 550</td>
<td>89 822</td>
<td>31.79</td>
</tr>
</tbody>
</table>
way and this could give more insight into effectiveness regarding exposure in real life. Furthermore, visitors’ behavior can be linked to visitors’ characteristics (Crutzen et al., 2008; Brouwer et al., 2010; Van’t Riet et al., 2010) and intervention outcome measures. By doing the latter, it is possible to study potentially effects of visitors’ behavior on interventions’ outcome measures (e.g. dose–response relationship).

Finally, it needs to be stressed that Google Analytics is no Holy Grail. The purpose of this study was not to make a comparison between different services or to discuss all features provided by Google Analytics, but to demonstrate its potential as a process evaluation method that is easy to implement and that can be used even if resources are limited (both in terms of time and financially). Although only one intervention has been described in this paper, this serves as an example of a method that can be applied to all Internet-delivered interventions. This is highly relevant given (i) the current expansion of these interventions within the field of health promotion and (ii) exposure being a prerequisite to establish desired intervention outcomes (e.g. changing determinants of behavior).

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**REFERENCES**


