Determining health-care facility catchment areas in Uganda using data on malaria-related visits

Kate Zinszer, Katia Charland, Ruth Kigozi, Grant Dorsey, Moses R Kamya & David L Buckeridge

Objective To illustrate the use of a new method for defining the catchment areas of health-care facilities based on their utilization.

Methods The catchment areas of six health-care facilities in Uganda were determined using the cumulative case ratio: the ratio of the observed to expected utilization of a facility for a particular condition by patients from small administrative areas. The cumulative case ratio for malaria-related visits to these facilities was determined using data from the Uganda Malaria Surveillance Project. Catchment areas were also derived using various straight line and road network distances from the facility. Subsequently, the 1-year cumulative malaria case rate was calculated for each catchment area, as determined using the three methods.

Findings The 1-year cumulative malaria case rate varied considerably with the method used to define the catchment areas. With the cumulative case ratio approach, the catchment area could include noncontiguous areas. With the distance approaches, the denominator increased substantially with distance, whereas the numerator increased only slightly. The largest cumulative case rate per 1000 population was for the Kamwezi facility: 234.9 (95% confidence interval, CI: 226.2–243.8) for a straight-line distance of 5 km, 193.1 (95% CI: 186.8–199.6) for the cumulative case ratio approach and 156.1 (95% CI: 150.9–161.4) for a road network distance of 5 km.

Conclusion Use of the cumulative case ratio for malaria-related visits to determine health-care facility catchment areas was feasible. Moreover, this approach took into account patients’ actual addresses, whereas using distance from the facility did not.

Introduction

Knowledge of a health-care facility’s catchment area is important for assessing health service utilization, for calculating population-based rates of disease and for performing other important analyses. Different approaches to defining catchment areas have been developed, mostly in the field of health service research. One simple way of establishing the boundaries of a catchment area is to use distance from the facility to another administrative area. We illustrate our method by using national administrative areas. Another limitation is that an area may include noncontiguous areas.

Under this approach it is assumed that people will visit the closest facility, which implies that distance is the overriding factor influencing attendance. However, distance is only one of many factors that influence the choice of health-care facility; others are the services available and the perceived quality of care.

Another approach, termed the patient-flow method, is based on the proportion of patients visiting or admitted to a health-care facility who come from a particular administrative area, such as a census tract or a postal code area: if the proportion exceeds a set minimum, that administrative area is included in the facility’s catchment area. With this approach, the catchment area is not limited by the distance between a patient’s residence and the facility. However, an arbitrary threshold is usually imposed on the minimum proportion of patients who must come from a particular area for it to be included in the catchment area. For example, postal code areas that account for less than 1% of admissions to a facility may be excluded from the catchment area. Consequently, some individuals who live in an area not considered part of a facility’s catchment area may regularly attend the facility. The likelihood that these minority “users” would be regarded as living outside the catchment area increases with the size of the administrative area. Another limitation is that an area may be excluded from the catchment area even though a large proportion of its population, or even the entire population, uses the facility because the proportion of patients attending the facility from that area does not exceed the minimum.

In this case, the chance of exclusion increases as the area’s population decreases.

Here we propose a new method for defining the catchment area of a health-care facility that builds and improves on the patient flow approach: the catchment area is defined using a statistical measure – the cumulative case ratio, which is the ratio of the observed to the expected utilization of the health-care facility for a particular condition by patients in an administrative area. We illustrate our method by using data on the utilization of malaria-related services to define the catchment areas of six health-care facilities in Uganda. Then, for each facility, we compare the cumulative rate of confirmed malaria cases in the catchment area derived using this approach with the rate in areas derived using the straight line or road network distance from the facility.

Methods

In this analysis we used data on outpatients attending health-care facilities for suspected malaria collected by the Uganda Malaria Surveillance Project, Kampala, Uganda. Knowledge of a health-care facility’s catchment area is important for assessing health service utilization, for calculating population-based rates of disease and for performing other important analyses. Different approaches to defining catchment areas have been developed, mostly in the field of health service research. One simple way of establishing the boundaries of a catchment area is to use distance from the facility to another administrative area. We illustrate our method by using national administrative areas. Another limitation is that an area may include noncontiguous areas.

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Another approach, termed the patient-flow method, is based on the proportion of patients visiting or admitted to a health-care facility who come from a particular administrative area, such as a census tract or a postal code area: if the proportion exceeds a set minimum, that administrative area is included in the facility’s catchment area. With this approach, the catchment area is not limited by the distance between a patient’s residence and the facility. However, an arbitrary threshold is usually imposed on the minimum proportion of patients who must come from a particular area for it to be included in the catchment area. For example, postal code areas that account for less than 1% of admissions to a facility may be excluded from the catchment area. Consequently, some individuals who live in an area not considered part of a facility’s catchment area may regularly attend the facility. The likelihood that these minority “users” would be regarded as living outside the catchment area increases with the size of the administrative area. Another limitation is that an area may be excluded from the catchment area even though a large proportion of its population, or even the entire population, uses the facility because the proportion of patients attending the facility from that area does not exceed the minimum.

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Methods

In this analysis we used data on outpatients attending health-care facilities for suspected malaria collected by the Uganda
Malaria Surveillance Project, in which a sentinel-site approach to monitoring the malaria burden in the country was adopted. The surveillance programme was implemented in a staggered fashion: it started in July 2006 and the final site opened in August 2008. We selected six sites to represent the diversity of malaria epidemiology in Uganda. They were all government, level-IV health centres that provided care free of charge, including diagnostic testing and medications, as has been described previously, and all had the laboratory equipment and trained staff needed for malaria diagnosis, case management and data collection. The data collected for each patient presenting to outpatient clinics included the patients’ demographic characteristics and parish of residence, the results of malaria diagnostic tests, the diagnosis and the treatments prescribed. The parish is the second smallest administrative unit in Uganda and each parish contains 5000 to 6000 inhabitants. A standardized case report form was used and data were entered electronically at each site by a data officer, who was supported by the Uganda Malaria Surveillance Project.

We determined which parishes should be included in the catchment area of each facility using three different parameters: the straight-line distance from the facility, the road network distance from the facility and the cumulative case ratio for malaria-related visits. To derive catchment areas based on straight-line distance, we used distances of 5, 10, 20 and 30 km. These distances were selected because the 2009 Uganda Malaria Indicator Survey found that 96% of respondents lived within 9 km of a health-care facility and because the 2009 Uganda National Household Survey reported that the average distance of a household from a government hospital was 20 km. The catchment area included all parishes that fell within circles centred on the facility with radii of 5, 10, 20 and 30 km, respectively. To derive catchment areas based on the road network distance, we used road distances of 5, 10, 20 and 30 km along the road networks surrounding each facility. The catchment area included all parishes located within a road distance of 5, 10, 20 or 30 km, respectively, from the facility. In addition, parishes were included if they were located less than 2 km from the nearest road. A parish that did not lie entirely within the distance circle or within the road network distance was included in the catchment area only if over 50% of its surface area lay within the relevant limit. Otherwise, it was excluded.

The cumulative case ratio was defined as the ratio of the observed to the expected number of malaria-related visits to a facility from a parish. Malaria-related visits included all visits between 1 January 2010 and 31 December 2012 by patients who had suspected or confirmed malaria or who tested negative for the disease. We used malaria-related visits because we wanted to include all users of malaria-related services, not only confirmed cases. The expected number of malaria-related visits to a facility from a particular parish was calculated by multiplying the parish’s population by the cumulative case ratio for that facility. A parish was included in the catchment area if the upper limit of the 95% confidence interval for the cumulative case ratio for that parish was 1 or greater because a ratio less than 1 indicated that the parish contributed significantly fewer malaria-related visits than expected for its population.

Catchment areas were derived for each of the six sentinel sites using the three parameters and the cumulative case ratio for each catchment area, however derived, over a 1-year period was calculated. The numerator was the total number of malaria cases confirmed between 1 January 2010 and 31 December 2012 from all parishes included in the catchment area. The denominator was the total population of all parishes included in the catchment area, which was derived using population estimates from the 2002 Uganda Population and Housing Census. During this period, an average of 98% of all patients with malaria symptoms were tested for malaria: the proportion ranged from 97% to 100% over the six sites.

Catchment areas were plotted on mapping files obtained from the Uganda Bureau of Statistics and the geographical coordinates of all parishes were recorded using zone 35 north of the Universal Transverse Mercator coordinate system. All analyses were performed using R software v2.14.0 and ArcGIS 10 (esri, Redlands, USA).

Results

Fig. 1 displays the cumulative case rate per 1000 population in each parish for all malaria cases confirmed during 2012 at one of the six Uganda Malaria Surveillance Project health-care facilities. The figure also shows the locations of the six facilities and the variation in disease burden and geographical spread. No catchment area definition was applied. It can be seen from the figure that the parishes with the highest cumulative case rates either contained a facility or was adjacent to one. Over 40% of parishes had a cumulative case rate of 1 per 1000 or less in 2012. Fig. 2 shows the catchment area of the Nagongera health-care facility, as determined using the three parameters: straight-line distance, road network distance and cumulative case ratio for malaria-related visits. The largest geographical area was obtained using a straight-line distance of 30 km, whereas the smallest was obtained using the cumulative case ratio. In addition, use of the cumulative case ratio led to the inclusion of noncontiguous parishes. Figures illustrating the corresponding catchment areas for the other five health-care facilities are shown in Appendix A (available at: http://surveillance.mcgill.ca/users/kzinszer/WHOBulletin/index.php).

As shown in Table 1, the cumulative rate of confirmed malaria cases varied considerably for most sites according to the way in which the catchment area was defined. In particular, the rate decreased with increasing distance from the facility for both straight line and road network distances and, generally, was highest when the catchment area was defined using a distance of 5 km. The largest rates were observed for the catchment area of the Kamwezi health-care facility: 234.9 per 1000 when defined using a straight-line distance of 5 km, 193.1 per 1000 when defined using the cumulative case ratio and 156.1 per 1000 when defined using a road network distance of 5 km. Although the denominator in the cumulative case rate calculation became much larger as distance increased, there was no corresponding increase.
Fig. 1. Cumulative rate of confirmed malaria cases in parishes containing patients who attended six health-care facilities, Uganda, 2012
Fig. 2. The Nagongera health-care facility’s catchment area as determined using the three parameters: straight-line distance, road network distance and cumulative case ratio for malaria-related visits, Uganda, 2012.

- **Straight line distance**
  - 5 km
  - 10 km
  - 20 km
  - 30 km
  - Health-care facility

- **Road network distance**
  - 5 km
  - 10 km
  - 20 km
  - 30 km
  - Road
  - Health-care facility

- **Cumulative case rate quintile (cases per 1000 population)**
  - 4.09–9.83
  - 9.83–22.67
  - 22.67–39.07
  - 39.07–116.15
  - 116.15–295.51
  - Health-care facility

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- Catchment areas were defined as lying within a straight-line distance from the facility of 5, 10, 20 and 30 km, respectively.
- Catchment areas were defined as lying within a road network distance from the facility of 5, 10, 20 and 30 km, respectively.
- A parish was included in the catchment area if the upper limit of the 95% confidence interval for the cumulative case ratio for the parish (i.e. the ratio of observed to expected malaria-related visits from the parish) was 1 or greater.

Research

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The differences observed between different estimates of the cumulative rate of confirmed malaria cases in catchment areas generally occurred because the numerator and denominator in the case rate calculation increased differentially with the distance used to define the catchment area. For example, the catchment area and its population were largest when a straight-line distance of 30 km was used; consequently, the denominator was also large. When a straight-line distance of 5 km was used, the numerator was only slightly smaller but the denominator was much smaller. Clearly, the distance between a patient’s residence and the health-care facility was important, but doubling the distance did not double the number of cases.

Defining a catchment area according to distance from the facility has the advantage of simplicity, but this approach does not take into account where patients actually live. Moreover, although distance is important, it is not the only factor influencing a patient’s choice. Use of the cumulative case ratio is not affected by distance since it uses patients’ actual addresses. As Fig. 2 demonstrates, catchment areas made up of contiguous parishes are generally geographically smaller than those defined using road network distance from the facility. The main limitation of our approach follows from the assumption that the reason the number of malaria-related visits from a particular parish was lower than expected was primarily because utilization of the health-care facility by the parish’s population was low. However, lower than expected utilization could have been due to a low incidence of symptoms characteristic of malaria in the parish. If the purpose of defining a catchment area is to estimate the cumulative case rate, generally, the size of the catchment area increased as the cumulative case rate decreased. This suggests that the numerator of the cumulative case rate included fewer patients and the denominator of the cumulative case rate included more patients. However, the cumulative case rate also included patients who did not utilize the health-care facility, which suggests that the denominator was too large. It is not clear how to account for this bias when defining catchment areas.

Table 1. Cumulative rate of confirmed malaria cases at six health-care facilities in Uganda, b by catchment area definition, 2012

<table>
<thead>
<tr>
<th>Catchment area definition</th>
<th>Aduku facility</th>
<th>Kamwezi facility</th>
<th>Kasambya facility</th>
<th>Kihiihi facility</th>
<th>Nagongera facility</th>
<th>Walulkuba facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straight-line distance, km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>89.2 (82.0–97.0)</td>
<td>234.9 (226.2–243.8)</td>
<td>2183 (2116–2251)</td>
<td>1219 (1175–1264)</td>
<td>1199 (1157–1243)</td>
<td>203 (196–201)</td>
</tr>
<tr>
<td>10</td>
<td>459 (43.7–48.2)</td>
<td>718 (69.3–743)</td>
<td>1162 (1129–1196)</td>
<td>592 (573–611)</td>
<td>434 (421.4–44.7)</td>
<td>148 (143–153)</td>
</tr>
<tr>
<td>20</td>
<td>133 (12.8–14.0)</td>
<td>22.0 (21.2–22.8)</td>
<td>395 (38.4–40.7)</td>
<td>213 (207.2–220)</td>
<td>121 (117.2–124)</td>
<td>8.2 (7.9–8.5)</td>
</tr>
<tr>
<td>30</td>
<td>7.2 (6.8–7.5)</td>
<td>8.2 (7.9–8.5)</td>
<td>218 (21.2–22.5)</td>
<td>110 (10.7–11.4)</td>
<td>61 (5.6–67)</td>
<td>4.8 (4.6–5.0)</td>
</tr>
<tr>
<td>Road network distance, km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0 (NA)</td>
<td>156.1 (150.9–161.4)</td>
<td>2183 (2116–2251)</td>
<td>128.9 (124.3–133.8)</td>
<td>1433 (1378–148.9)</td>
<td>5.5 (5.1–6.1)</td>
</tr>
<tr>
<td>10</td>
<td>485 (46.0–51.1)</td>
<td>130.0 (125.6–134.5)</td>
<td>2183 (2116–2251)</td>
<td>81.1 (78.6–83.8)</td>
<td>493 (47.8–509)</td>
<td>22.9 (22.2–23.7)</td>
</tr>
<tr>
<td>20</td>
<td>176 (16.8–18.5)</td>
<td>45.8 (44.2–47.4)</td>
<td>490 (47.7–50.5)</td>
<td>416 (40.4–43.0)</td>
<td>172 (167.7–17)</td>
<td>11.9 (11.5–12.3)</td>
</tr>
<tr>
<td>30</td>
<td>117 (11.2–12.2)</td>
<td>32.0 (30.9–33.2)</td>
<td>330 (32.0–33.9)</td>
<td>22.8 (22.1–23.5)</td>
<td>90 (8.7–92)</td>
<td>7.5 (7.3–7.8)</td>
</tr>
<tr>
<td>Cumulative case ratio e</td>
<td>38.1 (36.3–40.0)</td>
<td>193.1 (186.8–199.6)</td>
<td>672 (653–691)</td>
<td>87.6 (84.0–90.3)</td>
<td>384 (373–396)</td>
<td>43.3 (41.9–44.7)</td>
</tr>
</tbody>
</table>

CCR, cumulative case rate; CI, confidence interval; NA, not applicable.

a Data on the health-care facilities were collected by the Uganda Malaria Surveillance Project.

b Per 1000 population.

c Catchment areas were defined as lying within a specified straight-line distance from the facility.

d Catchment areas were defined as lying within a specified road network distance from the facility.

e A parish was included in the catchment area if the upper limit of the 95% CI for the cumulative case ratio for the parish (i.e. the ratio of observed to expected malaria-related visits from the parish) was 1 or greater.

Table 2. Definition of catchment areas in Uganda

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Discussion

In the numerator, the number of parishes included in each catchment area under the straight-line distance of 30 km was 105, while under the cumulative case ratio it was 10. The catchment area of the Aduku health-care facility did not contain any parishes when defined using a road network distance of 5 km (i.e. less than 50% of each parish’s area lay within the defined distance). The main limitation of our approach follows from the assumption that the reason the number of malaria-related visits from a particular parish was lower than expected was primarily because utilization of the health-care facility by the parish’s population was low. However, lower than expected utilization could have been due to a low incidence of symptoms characteristic of malaria in the parish. If the purpose of defining a catchment area is to estimate the cumulative case rate, generally, the size of the catchment area increased as the cumulative case rate decreased. This suggests that the numerator of the cumulative case rate included fewer patients and the denominator of the cumulative case rate included more patients. However, the cumulative case rate also included patients who did not utilize the health-care facility, which suggests that the denominator was too large. It is not clear how to account for this bias when defining catchment areas.
Table 2. Parishes, population and malaria cases in health-care facility catchment areas, by catchment area definition, Uganda, 2012

<table>
<thead>
<tr>
<th>Catchment area definition</th>
<th>No. of parishes</th>
<th>No. of confirmed malaria cases</th>
<th>No. of population</th>
<th>No. of confirmed malaria cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health-care facility catchment area</td>
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<td>2,135</td>
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<tr>
<td>Straight-line distance, km</td>
<td>5</td>
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<td>2,999</td>
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<tr>
<td>1</td>
<td>3,584</td>
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<td>2</td>
<td>5,788</td>
<td>3162</td>
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<td>5</td>
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<td>10</td>
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<td>20</td>
<td>88,508</td>
<td>4426</td>
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<td>156,834</td>
</tr>
<tr>
<td>30</td>
<td>132,247</td>
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<td>96</td>
<td>358,412</td>
</tr>
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<td>50</td>
<td>182,423</td>
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<td>135</td>
<td>559,896</td>
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<td>100</td>
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<td>200</td>
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<tr>
<td>300</td>
<td>333,098</td>
<td>11,972</td>
<td>254</td>
<td>1,457,435</td>
</tr>
</tbody>
</table>

<p>| Catchment areas were defined as lying within a specified straight-line distance from the facility. |</p>
<table>
<thead>
<tr>
<th>Straight-line distance, km</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
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<tr>
<td>No. of parishes</td>
<td>5</td>
<td>10</td>
<td>15</td>
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<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
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<td>100</td>
</tr>
<tr>
<td>No. of confirmed malaria cases</td>
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<td>5</td>
<td>8</td>
<td>10</td>
<td>15</td>
<td>20</td>
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<tr>
<td>No. of confirmed malaria cases</td>
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<td>70</td>
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<td>90</td>
<td>100</td>
</tr>
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Accurate identification of a facility’s catchment area is important for: understanding the population served; for planning and evaluating service delivery, including the accessibility of services; and for deriving population-based health indicators, such as disease burden. Conversely, an erroneous view of the catchment area can lead to inefficient and inadequate services, misspecification of the catchment population and potentially flawed decision-making on other facilities, such as deciding where to locate a new facility. Despite its limitations, the cumulative case ratio approach is more likely to produce an accurate estimate of the true catchment area than an approach using the straight line or road network distance because it is based on where patients actually live. In contrast, the distance approaches can lead to the inclusion of parishes where there are no cases of malaria.

The first consideration in using the cumulative case ratio approach to estimate a facility’s catchment area is to choose the basic administrative unit. It is best to use the smallest unit possible. The geographical location of patients must be recorded at the facility level and population data with the same geographical resolution must be obtained. Another consideration is the time period during which the catchment area’s utilization rate, this assumption may not be of concern since areas of low utilization are excluded. However, if the purpose is to obtain a population-based estimate of disease burden, the assumption may introduce an error and additional data on the background level of the disease in question would be required to assess the potential level of that error. There are also limitations inherent in using health-care utilization data to calculate population-based estimates of disease burden. Although attendance at a health-care facility is influenced by several factors associated with the individual patient, it is also affected by the characteristics of the facility, such as its capacity, which will limit the number of cases that can be seen. In addition, we had no information on “competing” facilities, whose presence may have influenced attendance at the six facilities we studied. Consequently, we may have underestimated the true cumulative case rate of malaria in the catchment areas since our analysis included only cases at Uganda Malaria Surveillance Project facilities.
ال фл قح: هو الا لاستخدام طريقة جديدة لتحديد مناطق مستجمعات مرافق الرعاية الصحية. 

للمرضى، في حين لم يراعى استخدام بعد المسافة عن المرفق. 

الاستنتاج كان استخدام نسبة الحالات التراكمية لتحديد مناطق مستجمعات مرافق الرعاية الصحية غير فعال. وعلاوة على ذلك، وضع هذا النهج في الحساب العلاقي. 

احتشادت نسبة الحالات التراكمية للملاريا لدائم عام على نحو كبير باختلاف الطريقة المستخدمة لتحديد مناطق المستجمعات. 

ω تمامًا. 

اليهيج، في حين لم يراعى استخدام بعد المسافة عن الموقف. والمرضى من مناطق إدارية صغيرة. وتم تحديد نسبة الحالات التراكمية للملاريا لمدة عام لكل منطقة مستجمع، وفق ما تم تحديد استخدام طريقة جديدة لتحديد مناطق المستجمعات. 

الاستنتاج كان استخدام نسبة الحالات التراكمية لتحديد مناطق مستجمعات مرافق الرعاية الصحية غير فعال. وعلاوة على ذلك، وضع هذا النهج في الحساب العلاقي. 

احتشادت نسبة الحالات التراكمية للملاريا لدائم عام على نحو كبير باختلاف الطريقة المستخدمة لتحديد مناطق المستجمعات. 

ω تمامًا.

الفلق: هو الاستخدام طريقة جديدة لتحديد مناطق مستجمعات مرافق الرعاية الصحية. 

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ω تمامًا.
Résumé

Détermination des zones desservies par les établissements de soins de santé en Ouganda en utilisant les données relatives aux consultations liées au paludisme

Objectif Ilustrer l'utilisation d'une nouvelle méthode de définition des zones desservies par les établissements de soins de santé en fonction de leur utilisation par les patients.

Méthodes Les zones desservies par 6 établissements de soins de santé en Ouganda ont été déterminées en utilisant le rapport cumulatif des cas: c'est-à-dire le rapport des utilisations observées sur les utilisations attendues d'un établissement par les patients provenant de petites zones administratives et consultant pour une maladie particulière. Le rapport cumulatif de cas pour les consultations liées au paludisme a été déterminé à l'aide des données du Projet de Surveillance du Paludisme en Ouganda. Les zones desservies ont également été obtenues en utilisant différentes distances en ligne droite et différentes distances de réseau routier à partir de l'établissement. Ensuite, le taux cumulatif des cas de paludisme a été calculé pour chaque zone desservie, telle que déterminée à l'aide des trois méthodes.

Résultats Le taux cumulatif des cas de paludisme de la première année variait considérablement en fonction de la méthode utilisée pour définir les zones desservies. Avec l'approche des rapports cumulatifs des cas, la zone desservie pouvait inclure des zones non contiguës. Avec les approches des distances, le dénominateur augmentait considérablement avec la distance, alors que le numérateur n'augmentait qu'assez légèrement. Le plus grand taux cumulatif des cas pour 1 000 habitants a été obtenu pour l'établissement de Kamwezi: 234,9 (intervalle de confiance à 95%, IC: 226,2–243,8) pour une distance en ligne droite de 5 km, 193,1 (IC à 95%: 186,8–199,6) pour l'approche de rapport cumulatif des cas et 156,1 (IC à 95%: 150,9–161,4) pour une distance de réseau routier de 5 km.

Conclusion Il est possible d'utiliser le rapport cumulatif des cas pour les consultations liées au paludisme afin de déterminer les zones desservies par les établissements de soins de santé. En outre, cette approche prend en compte les adresses réelles des patients, alors que ce n'est pas le cas lorsque l'on utilise les distances à partir des établissements de soins de santé.

Резюме

Определение районов охвата обслуживанием учреждениями здравоохранения в Уганда с использованием данных о посещениях в связи с малярией

Цель Проиллюстрировать использование нового метода определения районов охвата обслуживанием учреждениями здравоохранения, основанного на интенсивности их использования.

Методы Районы охвата обслуживанием шестью учреждениями здравоохранения в Уганда были определены с использованием совокупного коэффициента случаев заболеваний, т. е. коэффициента случаев вероятного использования учреждений для конкретного состояния пациентов из небольших административных районов. Совокупный коэффициент заболеваний для посещений данных учреждений в связи с малярией определялся с использованием данных Проекта по исследованию малярии в Уганда (Uganda Malaria Surveillance Project). Районы охвата обслуживанием также определялись с использованием различных расстояний по прямой и по дорожной сети до учреждения. Затем годовой совокупный коэффициент случаев заболеваний малярией вычислялся для каждого района охвата обслуживанием установленным образом с использованием трех методов.

Результаты Годовой совокупный коэффициент случаев заболеваний малярией варьировался в зависимости от метода, использовавшегося для определения районов охвата обслуживанием. При применении подхода, предполагающего использование совокупного коэффициента случаев заболеваний, в районы охвата обслуживанием могли быть включены районы, состоящие из нескольких холмистых участков. При применении подхода, предполагающего учет расстояния, знаменатель вместе с увеличением расстояния увеличивался существенно, в то время как числитель увеличивался лишь незначительно. Наибольший совокупный коэффициент случаев заболеваний на 1000 человек популяции был вычислен для учреждения в районе Камвэзи (Kamwezi): 234,9 (доверительный интервал (ДИ) 95 %, 226,2–243,8) для расстояния по прямой в 5 км, 193,1 (ДИ 95 %, 186,8–199,6) при применении подхода, предполагающего использование совокупного коэффициента случаев заболеваний, и 156,1 (95 % CI: 150,9–161,4) для расстояния по дорожной сети в 5 км.

Вывод Использование совокупного коэффициента случаев заболеваний для посещений в связи с малярией оказалось оправданным. Более того, этот подход принимает во внимание фактическое адреса пациентов, в то время как подходом, предполагающим использование расстояния до учреждения, это не предусмотрено.

Resumen

Definir las áreas de captación de los centros de salud en Uganda mediante datos de visitas relacionadas con el paludismo

Objetivo Ilustrar el uso de un nuevo método para definir las áreas de captación de los centros de salud basado en su uso.

Métodos Se determinaron las áreas de captación de seis centros de salud en Uganda mediante el cociente de caso acumulativo: el cociente entre el uso observado y el uso previsto de un centro para un condición particular por parte de pacientes de pequeñas áreas administrativas. Se determinó el cociente de caso acumulativo de las visitas relacionadas con el paludismo a dichos centros utilizando los datos del Proyecto de vigilancia de la malaria en Uganda. También se obtuvieron las áreas de captación en base a varias distancias lineales y de red vial respecto al centro de salud. Posteriormente, se calculó la tasa acumulativa de casos de malaria de un año para cada área de captación, determinada mediante los tres métodos.

Resultados La tasa acumulativa de casos de malaria de un año varió considerablemente con el método utilizado para definir las áreas de captación. Mediante el enfoque de la tasa acumulativa de casos, el área de captación podría incluir áreas no contiguas. Con los enfoques basados en la distancia, el denominador aumentó sustancialmente con la distancia, mientras que el numerador solo aumentó ligeramente. La mayor tasa acumulativa por 1000 habitantes se dio en el centro...
de Kamwezi: 234,9 (intervalo de confianza del 95 %, IC: 226,2–243,8) para una distancia lineal de 5 km, 193,1 (IC del 95 %: 186,8–199,6) para el enfoque de la tasa acumulativa de casos y 156,1 (IC del 95 %: 150,9–161,4) para una distancia de red vial de 5 km.

**Conclusión** El uso de la tasa acumulativa de casos para las visitas relacionadas con el paludismo a fin de determinar las áreas de captación de centros de salud fue factible. Además, este enfoque tuvo en cuenta las direcciones reales de los pacientes, mientras que el enfoque basado en la distancia respecto al centro no lo consideró.

**References**


