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## A population-based study of how children are exposed to saliva in Africa: implications for KSHV transmission

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### Background

Kaposi's sarcoma-associated herpesvirus (KSHV) is endemic among most sub-Saharan African populations. In those regions with the highest seroprevalences, there is a steady increase in KSHV seropositivity with age among children indicating that horizontal non-sexual transmission in childhood is the primary means of spread. While it is known that saliva is the body fluid that most commonly harbors KSHV and is therefore an important conduit for KSHV transmission, there is scant information on how African children are exposed to saliva and whether this exposure is preventable.

### Methods

In two settings in or near Durban, South Africa – Cato Manor, an urban community, and KwaXimba, a rural community – we first used qualitative methods to identify the range of acts by which children are exposed to saliva from others. We conducted focus groups and semi-structured interviews with prototypical individuals who have contact with children  $\leq 6$  years old, including mothers, fathers, grandparents, siblings, and traditional healers. We also performed participant observation, where we lived amongst families with children, observing and participating in their everyday activities. We then created a structured questionnaire to quantitate the prevalence of the various saliva-passing acts we identified in the qualitative work. The questionnaire was administered to a door-to-door population-based sample of mothers, fathers, grand-

mothers and siblings of children  $\leq 6$  years old residing in either Cato Manor or KwaXimba.

### Results

The qualitative work uncovered a total of 14 different practices by which children are exposed to saliva. For the structured questionnaire, a total of 258 mothers, 198 fathers, 204 grandmothers, and 236 siblings (97 brothers and 139 sisters) of children  $\leq 6$  years old ( $N = 896$ ; 398 from Cato Manor and 498 from KwaXimba) were interviewed; there were no refusals. In general, there were a number of practices by which saliva is passed to children, and a variety of different caregiver types engage in such practices (see Table 1 for representative acts). These acts include those that expose oral-respiratory mucosa to saliva, including ones that were previously appreciated (e.g., pre-mastication of food) as well as those less recognized (e.g., blowing herbs via mouth into a child's nostrils). Most of these acts were to fulfill a certain function (e.g., to relieve congestion), but others were ritualistic (e.g., rubbing pre-masticated herbs on the head or face). Acts that involved exposure of cutaneous surfaces to saliva included use of saliva to soothe an insect bite or wound. Finally, there were several heretofore unappreciated acts involving exposure of anal-rectal mucosa to saliva (e.g., insertion of saliva-lubricated finger into rectum to relieve constipation). This was one of the acts that was practiced differentially according to caregiver type.

**Table 1: Percent of caregivers who reported ever practicing acts involving saliva passage to children ≤ 6 years old**

| Practice  | Mothers<br>N = 258 | Fathers<br>N = 198 | Grandmothers<br>N = 204 | Siblings<br>N = 236 |
|---|--------------------|--------------------|-------------------------|---------------------|
| Shared toothbrush or toothstick                           | 14%                | 9%                 | 22%                     | 19%                 |
| Cleaned eyes or face with tongue                          | 19%                | 2%                 | 44%                     | 8%                  |
| Used mouth/cloth soaked with saliva to soothe insect bite | 18%                | 10%                | 28%                     | 8%                  |
| Premastication of food                                    | 67%                | 44%                | 81%                     | 68%                 |
| Shared sweets or candy                                    | 55%                | 67%                | 65%                     | 87%                 |
| Blown herbs via mouth into nostril                        | 5%                 | 4%                 | 23%                     | 0.8%                |
| Rubbed pre-masticated herbs on head or face               | 64%                | 76%                | 82%                     | 39%                 |
| Pushed substance into rectum from mouth through pipe      | 10%                | 4%                 | 25%                     | n/a                 |
| Inserted finger lubricated with saliva into rectum        | 15%                | 4%                 | 28%                     | n/a                 |

**Conclusion**

A variety of acts, practiced by a variety of persons of differing relation to children, expose children to saliva in Africa; there is no single predominant practice. This poses substantial challenges for epidemiologic work seeking to identify specific routes by which KSHV is spread. The saliva-passing acts include ones that expose oral-respiratory mucosa and cutaneous surfaces to saliva as well as acts that expose anal-rectal mucosa to saliva. The latter exposure has similarities to how homosexual men in resource-replete settings (who also have high KSHV seroprevalence) are exposed to saliva, providing speculation regarding a common route of KSHV transmission. While there are many acts that expose African children to saliva, the majority of these practices could be replaced by other actions and are therefore theoretically preventable.

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