

THE COST MINIMIZATION ANALYSIS OF AN OUTREACH DENTAL SERVICE: A PILOT STUDY AT AKINYELE LOCAL GOVERNMENT AREA IN NIGERIA

O.T. Alade, O.A. Arikawe, F.B. Lawal and J.O. Taiwo

Department of Periodontology and Community Dentistry, University College Hospital, Ibadan

Correspondence

Dr. O.T. Alade

Dept of Perio. & Comm. Dentistry,
University College Hospital,
Ibadan, Nigeria.

Tel: +2347069586649

E-mail: lolaalade@live.com

ABSTRACT

Background: Access to dental services improves oral health and thereby, overall general health. For people with limited or no access to oral health care services, outreach dental services may be used to reduce oral health inequality. There is however paucity of information on the economic analysis of outreach dental services in sub Saharan Africa.

Objective: To report a cost minimization analysis of an outreach dental service as compared with a primary oral health clinic.

Method: A comparative analysis of the costs expended in the treatment of patients at an outreach dental service of the University College Hospital, Ibadan was done versus the costs that would have been incurred if the patients had been treated at a Primary Oral Health Clinic of the same institution.

Results: A total of three hundred and forty two (342) participants were attended to at the outreach dental service. More than 80% of the 123 participants examined had an unmet oral health need. The procedures carried out were in keeping with the basic package of oral care. The average cost of the outreach per participant was ₦530 (~\$2.50) only versus an estimate of ₦868 (~\$4.13) per participant if the programme had been clinic based. The total cost savings was ₦115,344 (~\$549.26).

Conclusion: Outreach dental services provide similar dental treatment to services in a primary oral health clinic at a reduced cost.

Keywords: Access, Basic package of oral care, Cost analysis, Dental services, Oral health care, Oral health inequalities

INTRODUCTION

Access to oral health care is a challenge faced by a sizeable proportion of Nigerians.¹ Paradoxically, those with the greatest need for oral care have the least access to care.² Outreach dental services are uniquely poised to reduce disparities in access to oral health care services and are therefore one of the approaches to increasing access to dental services.^{3,4} They remove barriers to access such as cost of transport to the clinic, child minding concerns and geographic obstacles⁵ while still providing services of comparable quality to that offered in the clinic based services.⁶ Epidemiological surveys carried out in Ibadan, Nigeria have shown low caries prevalence among school children.⁷ Likewise, a study conducted in a local government area of Ibadan revealed low caries prevalence among the elderly and a mean Decayed Missing and Filled Teeth (DMFT) of 0.46.⁸ However, in a study assessing the periodontal health status in a population of elderly inhabitants of a local government area in Ibadan, periodontal disease was found to be of high prevalence, 94.8%.⁹ There is a low caries prevalence in the young and elderly, however most of the people affected are unable to

access dental treatment¹⁰ and this results in a high rate of untreated dental disease.⁸ This further results in premature loss of teeth, orofacial infections and deaths.^{11,12}

Outreach dental services offer a remarkable and practical approach to reducing inequalities in health and improving access to oral health care.^{4,13} In a systematic review of outreach dental services, it was found that outreach dental services are effective, reach a wider coverage and overcome barriers of access to care.¹³ Likewise, studies have shown that outreach dental services have lower unit costs per treatment than traditional stationary dental clinics.^{14,15} However, there is a dearth of information on cost analysis studies of outreach dental services in Nigeria. This should be addressed because the field of health economics has assumed increasing significance in the decision making process for health interventions and programmes.¹⁶ This is due to the need to allocate scarce resources efficiently, especially in low resource settings with grossly inadequate health financing.¹⁷

The four basic types of analyses described in health economics are Cost Minimization, Cost-Benefit, Cost-Utility and Cost Effectiveness analyses.¹⁸ A cost minimization analysis is appropriate when the outcomes for two programmes or interventions are similar but there is a need to determine the less expensive approach.¹⁹ This pilot study therefore aimed to report the cost minimization analysis of a dental outreach programme as compared with a primary oral health clinic.

MATERIALS AND METHODS

The study was a comparative analysis of costs incurred in a two-day outreach dental service at Akinyele Local Government Area of Oyo State, Nigeria versus an estimate of expenditure if the funds had been used to treat the same group of participants at a primary oral health clinic. The perspective for the cost analysis is that of the sponsors of the programme (the Akinyele Local Government Chairman and a non-governmental organization). The funds provided for the programme were only sufficient to provide basic oral health services to the members of the community. These basic oral health services could only have been offered as an outreach dental service or at a primary oral health centre.

Akinyele is one of the 33 Local Government Areas in Oyo State, Nigeria. The population was estimated at 211,811 in 2006.²⁰ The fluoride levels in drinking water in the local government range from 0.02 to 0.03 ppm.⁷ There is a general dental clinic in Akinyele Local Government Area that offers secondary level services and was therefore too advanced and costly for the aim of this programme. Two dentists man it usually and the dentist to population ratio was therefore about 1: 100,000. We partnered with this dental clinic for the follow up of patients attended to at the outreach.

The Idikan primary oral health care clinic, the comparison site for this study, is a traditional stationary primary dental clinic in Ibadan North West Local Government Area of Oyo State. Resident doctors and house officers (under the supervision of dental public health specialists) from the University College Hospital, Ibadan provide manpower in the clinic with the aid of a dental auxiliary and public health nurses. The treatments rendered in the clinic are also patterned after the Basic Package of Oral Care²¹ and include Oral Urgent Treatment (incisions & drainage, medications and extractions), Atraumatic Restorative Therapy, non-surgical periodontal therapy and Affordable Fluoride Toothpaste. All patients attending the clinic get oral health education and dietary counseling.²¹ Patients pay a minimal fee for registration and treatment.

Outreach Dental Service

A total sampling of the members of the public who attended the outreach programme at Akinyele Local Government Area received dental health education and free oral health care in accordance with the basic package of oral care. In addition free fluoridated toothpastes and toothbrushes were given to all attendees.

On the first day of the programme, two dentists gave participants oral health education with the use of visual aids and power point presentation. After this, 11 supervising dentists and 30 final year dental students (of the University College Hospital, Ibadan and University of Ibadan, Ibadan respectively) clerked and examined the participants using mouth mirrors, periodontal probes and caries probes under good natural light and pen torches. Dental treatment as determined by the diagnosis was then given to each participant on both days of the programme.

The dentists and students were grouped into four teams; the oral diagnosis, non-surgical periodontal therapy, surgical and paediatric teams. Each team had about three supervising dentists and seven students. The patients were seated on plastic chairs in the local government hall, screened from other patients during treatment and universal infection control measures were practiced. All instruments used during the outreach programme were sterilized at the Primary Oral Health Care Centre, Idikan (with a steril basic 18" BMS® autoclave) and transported in sterile instruments' drums to the outreach site daily. Sharps and other wastes were appropriately disposed off.

Data pertaining to the diagnosis, dental treatments and other services provided were obtained. This comprised of total number of patients examined, number of extractions, non-surgical periodontal treatments and atraumatic restorative therapies done. The costs in running the outreach mobile dental service were grouped into direct and indirect costs. Direct costs included the cost of instruments purchased, consumables, sterilization and medication. Indirect costs were transportation (of the healthcare team to the outreach site), refreshments, souvenirs, stationery, and publicity. In the tradition of community participation, the Akinyele Local Government Area council provided the hall, chairs and screens used for the outreach. The cost minimization analysis of the dental outreach programme was evaluated by comparing the mean cost of the dental outreach at Akinyele Local Government Area with the estimated mean cost that would have been incurred (per participant) if the funds from the sponsors had been used to treat the outreach participants at the Primary

Oral Health Care Centre in Idikan. This would have included transporting all participants from the Akinyele Local Government Area headquarters to the Primary Oral Health Centre, Idikan.

Assumption

The study was based on the assumption that the Basic Package of Oral Care offered at both the outreach dental service and primary oral health clinic, Idikan would result in similar treatment outcomes.⁴

RESULTS

The outreach programme at Akinyele Local Government Area attracted a total of 342 participants who all had oral health education. Table 1 shows the participants that had oral health examinations. The majority of them were adults (mean age 45.8 years \pm 16.32) with caries and poor oral hygiene. Only one of

have been Eight hundred and sixty eight naira (₦868) per participant if the dental service had been clinic based (Table 3). The overall cost difference was One hundred and fifteen thousand, three hundred and forty four naira only (₦115,344) to give an overall percentage cost reduction of 63.6%. Therefore, a sum of about Three hundred and thirty eight naira (₦338) was saved per participant.

DISCUSSION

In this study we investigated whether dental services with similar outcomes- clinic based dental services and outreach dental services have the same cost outlays. Our results revealed that this outreach dental service resulted in a cost minimisation compared with fixed dental service at a primary oral health clinic. The patients were treated at the outreach site rather than referred to the General Dental Clinic at Akinyele Local

Table 1: Descriptive characteristics of participants who had oral examinations

Characteristic	Children (N=21)	Adults (N=102)
Caries Present	4 (19%)	35 (34%)
Trauma to Anterior Teeth	2 (10%)	14 (14%)
Chronic Periodontal Disease	8 (38%)	47 (46%)
Treatment Need	20 (95%)	84 (82%)

the twenty one (21) children (mean age 11.3 years \pm 2.60) examined had no oral health treatment need. The dental procedure performed with the most frequency was non-surgical periodontal therapy (Figure 1). The outcomes of the outreach dental service and primary oral health clinic were similar because the emerging themes from both were patient satisfaction with treatment.

The total input costs of the outreach (Table 2) divided by total number of participants (342) gave an average cost of Five hundred and thirty naira (₦530) per participant while the average cost per participant would

Table 2: Input cost of outreach dental service

Item	Cost (₦)
Transportation	38,000
Instruments	11,500
Consumables	20,556
Refreshments	28,830
Medications	5,640
Stationery	1,350
Toothbrushes and Toothpastes	12,500
Publicity	56,000
Telecommunications	7,000
Total	181,376

Table 3: Standard cost profiles for Dental procedures at Idikan primary oral health clinic

Procedure	Cost (₦)	N of Outreach Participants	Projected Cost (₦)
Registration	250	342	85,500
Oral Prophylaxis	1500	61	91,500
Extraction	2000	27	54,000
Deep Curettage	1000	2	2,000
Atraumatic Restorative Therapy	1000	9	9,000
Transportation*	160	342	54,720
TOTAL			296,720

*Estimated round trip cost from Akinyele LG headquarters to Idikan on the cheapest public fare

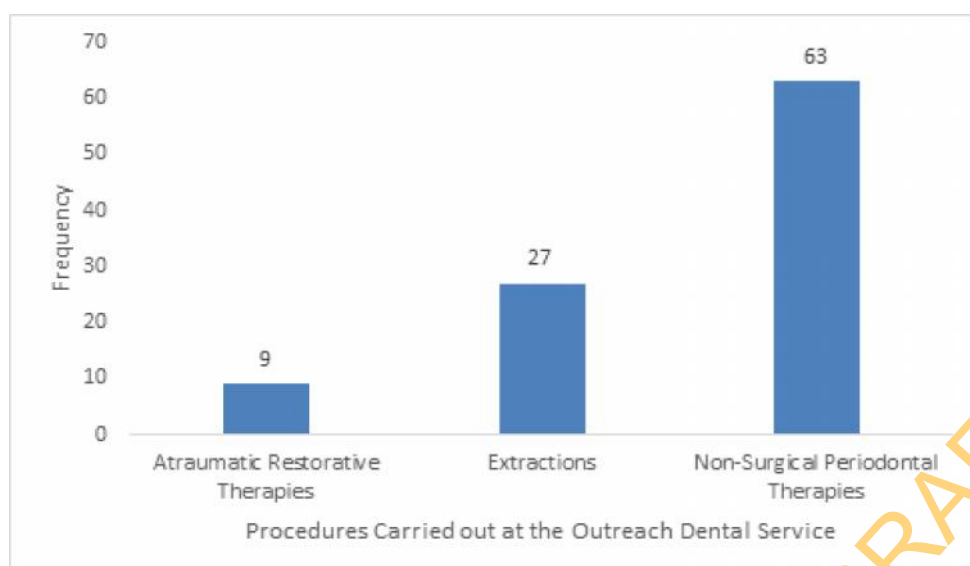


Figure 1: Bar Chart depicting treatment procedures carried out on participants

Government Area because the goal of the programme was to provide primary level dental services (Basic Package of Oral Care) to the most number of people possible.

The treatment need profile of the participants examined is similar to findings in other studies^{14,22,23} The finding that the outreach dental service resulted in significant cost savings compared to a fixed dental service is supported by our finding of an average of N338 saved per person and an overall cost difference of 115,344 (63.6%).

This result is similar to that recorded by Tianwivat et al in a comparative study of hospital based and mobile dental services in southern Thailand.²⁴ Other studies have however highlighted the fact that mobile dental services are often not self-sustaining, they are usually services provided for those who are unable to pay for dental care.²⁵⁻²⁷ Similarly, Laloo et al noted that outreach dental services reduce unmet oral health needs in underserved populations only in the short term but provided an excellent avenue for stimulating an interest, among dentists, to work in underserved communities.²⁸

It is important to document a cost minimization analysis of outreach and clinic based dental services because an evidence base is necessary to guide decision makers. This evidence base would assist programme planners to efficiently allocate limited resources. This is particularly germane in developing countries where secondary and tertiary level hospitals are often the first line providers of health care services.^{29,30} This study has also highlighted the need to approach access from the perspective of getting care to where people are.

LIMITATIONS

One limitation of this study is that it focussed on curative rather than preventive dental service. Our explanation for this is that dentists are often not the first line providers of care for oral diseases in communities across Nigeria with a resulting high rate of complications.³¹ We therefore sought to improve the visibility of dental services whilst providing oral health education as a preventive strategy.

Another limitation is that the procedures at the outreach were performed by final year dental students under the supervision of resident doctors whilst in the primary health clinic, resident doctors assume this role. Our explanation for this is that the Basic Package of Oral Care (under which the outreach and primary health clinics are operated) are basic skills which are designed to be carried out by dental auxiliaries.^{32,33}

Similarly, the costings in this study were not completely exhaustive. However the study remains relevant as a pilot study because it charts the path for future studies in the area of oral health economics in resource limited settings.

CONCLUSION

Outreach dental services provide similar dental treatment to services in a primary oral health clinic at a reduced cost.

ACKNOWLEDGEMENTS

The programme was supported financially by Honourable Ope Salami (Caretaker Chairman, Akinyele Local Government Area) and Mr Osunbunmi (Chairman, Health Heralds).

We also appreciate Dr Abimbola S. Olugbemide (Government Dental Clinic, Moniya, Ibadan), resident doctors and dental students of the University College Hospital, Ibadan for being facilitators at the programme.

REFERENCES

1. **Olusile A.** Improving Low Awareness and Inadequate Access to Oral Health Care in Nigeria: The Role of Dentists, the Government & Non-Governmental Agencies. *Niger Med J.* 2010;51(3): 134-136.
2. **Hart JT.** The Inverse Care Law. *The Lancet.* 1971;297(7696):405-412.
3. **Patrick DL,** Lee RS, Nucci M, *et al.* Reducing Oral Health Disparities: A Focus on Social and Cultural Determinants. *BMC Oral Health.* 2006;6 (Suppl 1):S4.
4. **Bayne A,** Knudson A, Garg A, Kassahun M. Promising Practices to Improve Access to Oral Health Care in Rural Communities. *Rural Evaluation Brief* [Internet]. 2013 24th June 2016; Y series(7). Available from: http://www.norc.org/PDFs/Walsh%20Center/Oral_Rural%20Evaluation%20Issue%20Brief-6pg_mm.pdf.
5. Rural Assistance Centre. *Barriers to Oral Health Care in Rural Communities* [11th Feb. 2015]. Available from: <http://www.raonline.org/communityhealth/oral-health/1/barriers>.
6. **Larsen C,** Larsen M, Kim M, *et al.* Sequential Years of Dental Outreach to Jamaica. Gains toward Improved Caries Status of Children. *The New York state dental journal.* 2013;80(5):40-45.
7. **Ajayi DM,** Denloye OO, Dosumu OO. The Fluoride Content of Drinking Water and Caries Experience in 15-19 Year Old School Children in Ibadan, Nigeria. *Afr J Med Med Sci.* 2008;37(1):15-19.
8. **Taiwo J,** Onyiaso C, Kolude B, Ibiyemi O. Dental Caries Experience among the Elderly Population in South East Local Government Area in Ibadan, Nigeria. *Odontostomatol Trop.* 2007;30(118):31-36.
9. **Taiwo J,** Jeboda S, Motayo T, Obiechina A. Periodontal Health of the Elderly People in South East Local Government Area in Ibadan, Nigeria. *Afr J Med Med Sci.* 2004;33(4):285-291.
10. **Osuh M,** Oke G, Asuzu M. Dental Services and Attitudes Towards Its Regular Utilization among Civil Servants in Ibadan, Nigeria. *Ann Ib Postgrad Med.* 2014;12(1):7-14.
11. **Petersen PE,** Bourgeois D, Ogawa H, *et al.* The Global Burden of Oral Diseases and Risks to Oral Health. *Bull World Health Organ.* 2005;83(9):661-669.
12. **Azodo CC,** Chukwumah NM, Ezeja EB. Dentoalveolar Abscess among Children Attending a Dental Clinic in Nigeria. *Odontostomatol Trop.* 2012; 35(139):41-46.
13. **Vashishtha V,** Kote S, Basavaraj P, *et al.* Reach the Unreached - a Systematic Review on Mobile Dental Units. *Journal of clinical and diagnostic research: JCDR.* 2014; 8(8): Ze05-8.
14. **Holtshousen WS,** Smit A. A Cost-Efficiency Analysis of a Mobile Dental Clinic in the Public Services. *Sadj.* 2007;62(8):336-338.
15. **Tianviwat S,** Birch S, Chongsuvivatwong V. Comparison of the Effects of Secondary Prevention in Schoolchildren between Hospitals with and without Mobile Dental Services in Southern Thailand. *Journal of oral science.* 2009; 51(1):97-102.
16. **Weinstein MC,** Stason WB. Foundations of Cost-Effectiveness Analysis for Health and Medical Practices. *The New England journal of medicine.* 1977; 296(13):716-721.
17. **Adeniyi AA,** Sofola OO, Kalliecharan RV. An Appraisal of the Oral Health Care System in Nigeria. *Int Dent J.* 2012;62(6):292-300.
18. **Higgins AM,** Harris AH. Health Economic Methods: Cost-Minimization, Cost-Effectiveness, Cost-Utility, and Cost-Benefit Evaluations. *Critical care clinics.* 2012;28(1):11-24.
19. **Rascati K.** Essentials of Pharmacoeconomics: Wolters Kluwer Health; 2013.
20. **Beazoglou T,** Douglass J, Myne-Joslin V, *et al.* Impact of Fee Increases on Dental Utilization Rates for Children Living in Connecticut and Enrolled in Medicaid. *J Am Dent Assoc.* 2015;146(1):52-60.
21. **Aderinokun GA.** Review of a Community Oral Health Programme in Nigeria after 10 Years. *African Journal of Biomedical Research.* 2000;3:123-128.
22. **Adegbembo AO,** el-Nadeef MA, Adeyinka A. National Survey of Dental Caries Status and Treatment Needs in Nigeria. *Int Dent J.* 1995;45 (1):35-44.
23. **Akpata E.** Oral Health in Nigeria. *Int Dent J.* 2004; 54(S6):361-366.
24. **Tianviwat S,** Chongsuvivatwong V, Birch S. Estimating Unit Costs for Dental Service Delivery in Institutional and Community-Based Settings in Southern Thailand. *Asia Pac J Public Health.* 2009; 21(1):84-93.
25. **Sandesh N,** Nagarajappa R, Hussain SA, *et al.* Utilization of Mobile Dental Vans at Post Graduate Dental Institutions in India. *Oral health and dental management.* 2014; 13(1):20-26.
26. **Siruta KJ,** Simmer-Beck ML, Ahmed A, *et al.* Extending Oral Health Care Services to Underserved Children through a School-Based Collaboration: Part 3 - a Cost Analysis. *Journal of*

- dental hygiene : JDH/American Dental Hygienists' Association.* 2013;87 (5):289-298.
27. **Arevalo O**, Chattopadhyay A, Lester H, Skelton J. Mobile Dental Operations: Capital Budgeting and Long-Term Viability. *J Public Health Dent.* 2010; 70(1):28-34.
 28. **Laloo R**, Evans JL, Johnson NW. Dental Care Provision by Students on a Remote Rural Clinical Placement. *Aust N Z J Public Health.* 2013;37(1):47-51.
 29. **Akande TM**. Referrral System in Nigeria: Study of a Tertiary Health Facility. *Ann Afr Med.* 2004;3 (3):130-133.
 30. **Oyedeji R**, Abimbola S. How Tertiary Hospitals Can Strengthen Primary Healthcare in Nigeria. *Niger Med J.* 2014;55(6):519-520.
 31. **Oke GA**, Bankole OO, Denloye OO, *et al.* Traditional and Emerging Oral Health Practices in Parts of Nigeria. *Odontostomatol Trop.* 2011;34 (4):35-46.
 32. **Wilson KE**, Wilson I, Holmes RD. Oral Urgent Treatment (out) - a Volunteer Led Training Programme in North West Tanzania. *Br Dent J.* 2012;212(9):443-448.
 33. **Helderman W**, Benzian H. Implementation of a Basic Package of Oral Care: Towards a Reorientation of Dental Ngos and Their Volunteers. *Int Dent J.* 2006;56(1):44-48.

UNIVERSITY OF IBADAN LIBRARY