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Accessibility of primary healthcare in low and middle income countries: a systematic review

Muhammad Daood[1], Saira Afzal[2], Ahtisham ul Haq[3], Ali Akram Khan[4], Taimoor Akram Khan[5], Khunsa Junaid[6]

[1]*King Edward Medical University, Lahore, Pakistan.*

[2]*Department of Community Medicine, King Edward Medical University, Lahore, Head of department, Prof of Community Medicine.*

[3]*Sir Ganga Ram Hospital, Lahore as Medical Superintendent,.*

[4]*Department of Community Medicine, King Edward Medical University, Lahore, Pakistan.*

[5]*Department of Community Medicine, King Edward Medical University, Lahore, Pakistan.*

[6]*Department of Community Medicine, King Edward Medical University, Lahore, Pakistan*

***Corresponding author**

Muhammad Daood, King Edward Medical University, Lahore, Pakistan.

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Abstract

Background: *Accessibility to healthcare is the capability of a population to obtain a specified set of healthcare services. There is a direct link between the distance patients travel to access health and the reduction of ill health and suffering in a country. This has an important impact on the quality of life of people.*

Objective: *To find the spatial or geographic determinants of accessibility of primary healthcare provision in low and middle income countries during last two decades.*

Methods: *Systematic review was done according to PRISMA guidelines. Data bases used were Google scholar, PubMed and Science direct. We found ten different studies from eight different economic groups of countries. Accessibility of primary healthcare in low and middle Income countries published during the period of last two decades were included using the key words like Spatial Accessibility;Geographical Accessibility; Primary Health Care; Primary Care; Low and middle income countries. The countries included were Afghanistan, Bangladesh, Bhutan, Democratic Republic of Congo, India, Indonesia, Sudan, Mozambique /Rural Africa. Two studies each from India and Mozambique (Rural Africa) were included. The categorization as low and middle income counties was as per World Bank classification.*

Results: *We found that accessibility to primary healthcare was worse in low income countries like Afghanistan, Mozambique and South Sudan where more than two third of the population lived in underserved or difficult to access areas while rest of the countries, which come under category of lower middle income countries, more than half of the population lived in underserved or difficult to access areas.]*

Conclusion: *Health care ease of access is a single most important component for equitable and adequate health system. Guaranteeing a healthcare system which is easily accessible to the people is a basic consideration for public health policy makers, policy implementers and academicians.*

Introduction

World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF) have defined Primary Health Care as "a whole-of-society approach to health that aims at ensuring the highest possible level of health and well-being and their equitable distribution by focusing on people's needs and as early as possible along the continuum from health promotion and disease prevention to treatment, rehabilitation and palliative care, and as close as feasible to people's everyday environment [1]". A vision set for primary health care in the 21st century by

WHO and UNICES is towards Universal healthcare (UHC) and the Sustainable Development Goals (SDGs).

Alma-Ata Declaration has drawn eight essential components of PHC [2]. These are 1) Health education on prevailing health problems and the methods of preventing and controlling them; 2) Nutritional promotion including food supply; 3) Supply of adequate safe water and sanitation; 4) Maternal and child health care; 5) Immunization against major infectious diseases; 6) Prevention and control of locally endemic diseases; 7) Appropriate treatment of common diseases and injuries; and 8) Provision of essential drugs.

Accessibility to healthcare is the capability of a population to obtain a specified set of healthcare services. The quality of healthcare has four measurements of access [3]. 1) Geographic accessibility or the physical remoteness or travel time to the prospective user. 2) Availability or having the proper type of care as per needs of the user. 3) Financial accessibility or willingness and ability of users to pay for services. 4) Acceptability or response of the health services providers to the social and cultural needs.

Primary health care (PHC) is a commanding strategy to providing "health for all" and is widely accepted as a universal solution for improving population well-being in the world [3]. If PHC is justifiably distributed it can play important role in averting diseases and decreasing health disparity on a large scale in society. According toWHO investments in PHC improve equity and access [1].

Universal health coverage is considered as a pillar of sustainable development. There is a direct link between the distance patients travel to access health and the reduction of ill health and suffering in a country [4]. In third world countries the distance covered by patients is usually greater than in developed world countries, in which healthcare facilities are more accessible. This has an important impact on the quality of life of people of these countries [3].

Identifying different levels of spatial accessibility to healthcare services in a certain area allows decision makers to understand the impacts of opening, closing, changing location or modifying the services offered by existing facilities [4]. The lack of health facilities close to people is a major obstacle to reaching health facilities and can inhibit access. Long travel times and greater distances can lead patients not to repeat the visit to the healthcare facilities [4,5].

Attaining Universal Health Coverage needs greater than simply increasing enough sources for national health systems, World Health Organization suggests that approaches to encourage competence and reduce waste in health systems are also desired, as 20% to 40% of resources spent on health are lost due to inefficiency [6]. In remote studies relating to measuring the accessibility of PHC Euclidean method, focusing only on distance, was used which have been replaced by more accurate network and raster based methods in Geographic information system (GIS) [7].

The use of Geographic information system (GIS) in community health has been evolved as useful technology service and software tool for the measurement of accessibility of PHC services and is currently being used for the understanding and dealing of health problems in different geographic areas [4]. GIS platform is used to accomplish two-step floating catchment area (2SFCA) model.

A two-step floating catchment area (2SFCA) model is a gravity model which has been used widely for measurement of determinants of accessibility in relevant studies. This model catches service area twice [8]. In the first step, it considers the healthcare facility demand for the population to population ratio and in the second step measures the accessibility by summing up the all the Values of those service areas within the threshold [9] 2SFCA is based on incorporating the interaction among supply, potential demand, and travel cost in their characterization of spatial accessibility [8]. In this model mutually the relative and absolute distance effects are assimilated into the accessibility measurement [9].

Rationale

The spatial or geographic dimensions of access comprises of accessibility and availability of services. Accessibility, spatial or geographic accessibility, is a measure of the "friction of distance" or "burden of travel" between locations, whereas availability generally measures the number of services in comparison to the number of possible consumers of the facility [7,10]. By identifying areas with limited spatial accessibility of health care services helps health managers to comprehend the effects of opening, closing, or relocating health care facilities or adjusting the services offered by present facilities [7], that is why accurate and detailed depictions of spatial accessibility are vital to narrate and apprehend the overall access situation.

Objective

To find the spatial or geographic determinants of accessibility of primary healthcare provision in low and middle income countries during last two decades.

Methodology

Systematic review was done as per PRISMA guidelines using public domain search engine such as PubMed, Google Scholar and Science direct (Elsevier). Keywords used for article search were Spatial Accessibility; Geographical Accessibility; Primary Health Care; Primary Care; Low and middle income countries. Inclusion criteria was original articles and abstracts on accessibility of primary healthcare in low and middle Income Countries published in English language during the period of last two decades (June, 2000 to May 2021). Studies covering rural population and/or urban dwellers of low and middle income countries (regional or nationwide studies) were included. For classification of low and middle income countries the guidelines of World Bank were considered [11] (Figure 1). Only those studies were included which have used one of the quantitative methods of measurement of accessibility of Primary Health Care like Geographic Information System (GIS) Model, Application of two step floating catchment area model, Enhanced two-step floating catchment area (E2SFCA) or Mapping and spatial analyses. Commentaries, Editorials, opinions, descriptive studies, Gray literature and unpublished works were excluded. Date of our search was 12th June, 2021.

In this systematic review, we found ten different studies from eight

different economic group of countries. The countries included are Afghanistan, Bangladesh, Bhutan, Democratic Republic of Congo, India, Indonesia, Sudan, Mozambique or Rural Africa.Two studies each from India and Mozambique (Rural Africa) were included. The categorization as low and middle income counties was, as per World Bank classification. According to this classification [11] Afghanistan, Mozambique and South Sudan belong to low income countries while the rest, Bangladesh, Bhutan, Democratic Republic of Congo, India and Indonesia belong to lower middle income countries.

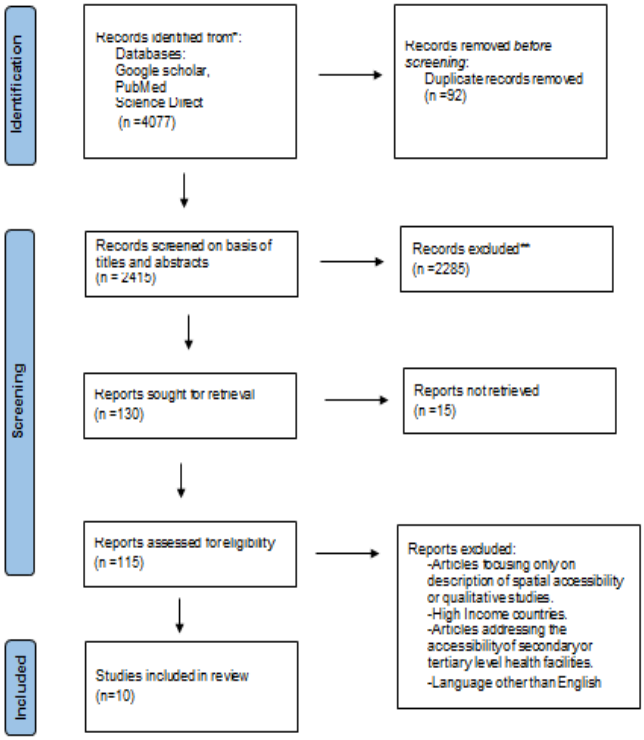

Figure 1: Identification of studies via databases and registers.

Results

In a nationwide study in Bhutan, accessibility values from 2010 to 2013 were analyzed by, nearest-neighbor modified two-step floating catchment area (NN-M2SFCA) model, both spatially and temporally producing accessibility ranking maps, plotting Lorenz curves, and conducting spatial clustering analysis [12]. The findings in 2013 showed that 24 percent of Bhutan's population had poor access to primary healthcare services, 66 percent of the population had medium-level access, and 10 percent had good access [12] (Figure 2).

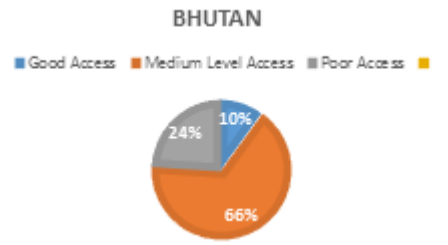

Figure 2: Access of Bhutan's population to primary healthcare services.

In Afghanistan, from 2010 to 2015 at the national and subnational levels, spatial accessibility and distribution of public facilities providing maternal health care and the differences in travel time assessments were conducted using different transportation modes [13].The methodology included, mapping and spatial analyses to assess the proportion of pregnant women able to access any EmOC health facility within 2 h by foot, animal, motor vehicle and a combination of transport modes [13]. The study concluded that 2 h of travel time was 36.6% by foot & 71.2% by a combination of transport, it was a 8.3% and 63.2% increase in access to EmOC facilities within 2 h of travel time by a combination of transport modes and by foot, respectively, as compared to 2010 [13].

Southern Sudan, got independence in 2011, had 1747 public health facilities in 78 counties but civil conflict caused 294 public health facilities nonfunctional. Access to a service provider was poor with only 25.7% of the population living within one-hour walking time to a facility and 28.6% of the population within 5 km of the public health facilities [14].

In Mozambique, two travel time scenarios like walking and driving were used to access the population attending health care centers. The study found 90 percent of area of Mozambique was inaccessible by walking while 67 percent population of Mozambique lived in underserved areas [4] (Figure 3).

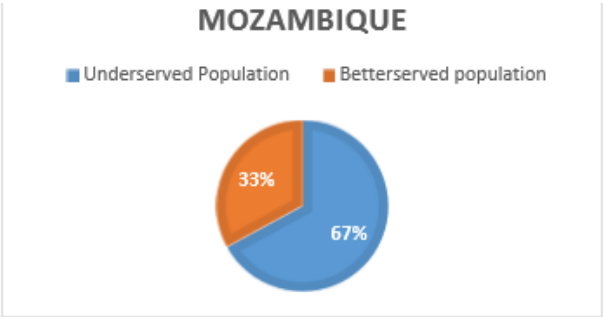

Figure 3: Access of Mozambique's population to healthcare facilities.

A raster-based accessibility measurement in Democratic Republic of Congo showed that 25 percent of population had an access to nearest facility within two hours by walking while it was 50 percent and 44 percent by motor and bus travel scenarios [15] (Figure 4).

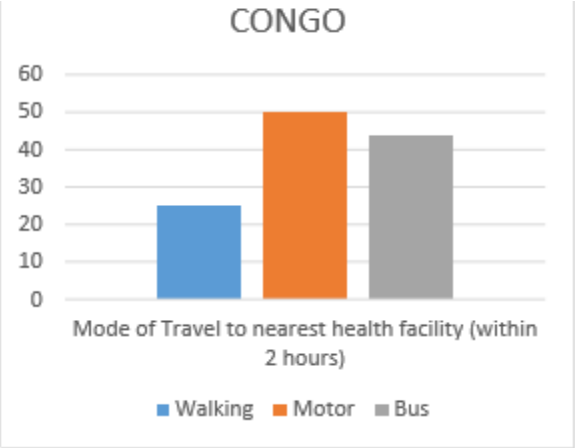

Figure 4: Access of Congo's population to healthcare facilities.

A study in rural Africa about measurement of accessibility of sexual and reproductive health care, using family planning as an example, concluded that population in southern part of rural Africa had better access, in terms of number of clinics and distance from town, while northern part had poor access to sexual and reproductive health care [16].

In a case study in Bangladesh the study area, Khulna city, was divided into hexagons of equal size, and accessibility was measured from the center of each hexagon using GIS software. 40% of the population was found living within 500 m of a Urban Primary Health Care Centers (UPHCC) and 88.99% population was within 1.5 Km of a UPHCC [17] (Figure 5).

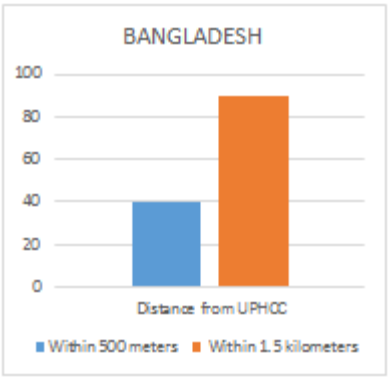

Figure 5: Access of Bangladesh's population to healthcare facilities.

Similarly a Case Study in Indonesia, Cianjur Regency; the study area, the spatial healthcare Facilities accessibility was measured by using Two-Step Floating Catchment Analysis by taking travel time threshold and the quality of healthcare facilities across the study area. The disparities in healthcare access the study area were pointed by accessibility index using two step floating catchment area method. The higher accessibility index was taken as having higher accessibility. The 86 percent of the districts were having the lowest value of 2SFCA Index (between 0-0.5) while for the 6.6 percent districts Index value was between 0.5-0.99, 3.3 percent of districts were having the index value of 0.99-1.49.The highest accessibility value (3.48-3.97) belonged to less than 3.3 percent of the area [18].

In a study in India, Tribal District of Gujarat; the study area, the accessibility index was divided into five categories between the values of 0.000 to 150.956 using GIS network analysis tool to execute the 2SFCA method taking proximity of distance less than 6.26 km. The calculation of healthcare facility demand for the population to population ratio and assessing the accessibility by summing up the all the values of those service areas within the threshold showed an obvious disparity in the accessibility of existing 66 primary health care centers for population of 692 villages in the study area [19].

In another study in India, the district of Nalgonda in the Indian state of Telangana; the study area, having 566 villages and 32 primary health care centers and attached 257 sub centers, the proximity of services provided relative to the location of the population by using Euclidean catchment access method showed that 142 villages or 25 percent of the total villages were out of catchment area while travel distance method showed 225 villages or 39.7 percent of the total villages were outside catchment access area of health facilities [20] (Figure 6 and Table 1) .

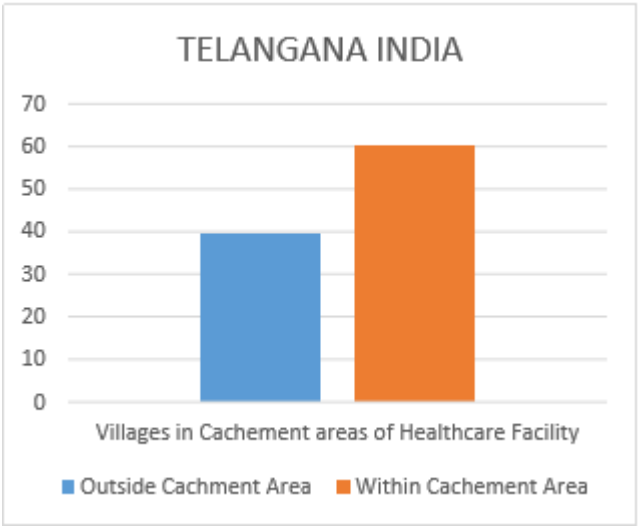

Figure 6: Access of Telangana's population to healthcare facilities.

Table 1: Access to healthcare facilities in Low and Middle Income Countries.

Sr. No	Location of Study	Type of Study	Title of the study	Purpose of Study	Method of spatial accessibility assessment used	Accessibility determinants
1	Bhutan	Cross sectional analytical	Spatio-Temporal Analysis of Spatial Accessibility to Primary Health Care in Bhutan	Spatial accessibility to primary health care services between 2010 and 2013	The nearest-neighbor modified two-step floating catchment area (NN-M2SFCA) model	Poor access: 24 % Medium access category: 66% Good access: 10%
2	Afghanistan	Cross sectional Comparative	National and subnational estimates of coverage and travel time to emergency obstetric care in Afghanistan: Modeling of spatial accessibility	spatial distribution of public facilities providing maternal health care in Afghanistan, specifically emergency obstetric care (EmOC), and the differences in travel time estimates using different transportation modes from 2010 to 2015 at the national and subnational levels	Mapping and spatial analyses to measure the proportion of pregnant women able to access any EmOC health facility within 2 h by foot, animal, motor vehicle and a combination of transport modes.	within 2 h of travel time was 36.6% by foot & 71.2% by a combination of transport Modes in 2015. An 8.3% and 63.2% increase in access to EmOC facilities within 2 h of travel time by a combination of transport modes and by foot only as compared to 2010
3	South Sudan	Cross sectional analytical	Spatial accessibility to basic public health services in South Sudan	To compute the fraction of the population within 1 hour walking distance of the nearest public health facility offering curative services	Euclidean Distance Tool in ArcGIS.	71% of the population living in areas outside 5 km, which is approximately equivalent to 1 hour from a public health facility
4	Mozambique	Cross sectional analytical	Geographic accessibility to primary healthcare centers in Mozambique	To measure the geographic accessibility of population to existing Healthcare Centers (HC), and to estimate the number of persons served by the health network of Mozambique.	Health facilities' locations together with population, elevation, and ancillary data were used to model accessibility to HC using GIS.	About 7,151,066 (33.3 %) of Mozambicans are living in a served area, while the remaining population, 14,300,572 (66.7 %) are living in an underserved area

5	Democratic Republic of Congo	Cross sectional analytical	Improving the spatial accessibility of healthcare in North Kivu, Democratic Republic of Congo	To assess the spatial accessibility to healthcare under three travel case scenarios	A raster-based accessibility measurement Approach with the 2-hrs travel distance constraint.	25%, 50%, and 44% of population reached the nearest hospital within 2-hours under walking, motor and, bus travel scenarios.
6	Rural Africa	Cross sectional analytical	A geographical perspective on access to sexual and reproductive health care for women in rural Africa	To measure and evaluate access to Sexual and Reproductive Health care services in rural Mozambique	Geographical information system (GIS) with population Survey data. Gravity model-based method. Spatial patterns of access to health services accounted distance effects, environmental influences, socioeconomic factors, individual and community characteristics	Potential geographic influences on access to SRH services in rural Mozambique. $P < 0.05$
7	Bangladesh	A Case Study	Measuring Physical Accessibility to Health Facilities – A Case Study on Khulna City	To Measuring Physical Accessibility to Health Facilities (Urban Primary Health Care Centers-UPHCC)	GIS software	40% of the population are within 500 m of a UPHCC; 88.99% population are within 1.5 Km of a UPHCC
8	Indonesia	A Case Study	MEASURING SPATIAL HEALTHCARE FACILITIES ACCESSIBILITY USING TWO-STEP FLOATING CATCHMENT ANALYSIS (2SFCA) Case Study: Cianjur Regency, Indonesia	To measure and map the spatial disparities of healthcare facilities using a Two-Step Floating Catchment Analysis (2SFCA).	Two-Step Floating Catchment Analysis	2SFCA Index: 0-0.5 (86%), Index value 0.5-0.99 is only 6.6%, while only 3.3% of districts having the index value of 0.99-1.49. The highest accessibility value (3.48-3.97) only belongs to less than three areas (3.3%).
9	India	Cross sectional analytical	Accessibility to Primary Health Centre in a Tribal District of Gujarat, India: application of two step floating catchment area model	To Measure the accessibility of Primary Health Centers.	GIS network analysis tool to execute the 2SFCA method.	The study identified the villages where health care accessibility is substantial and also Identified pockets in the villages lacking access. PHCs in the villages considered Threshold distance of 6.28 km as the radial distance.

10	India	Cross sectional analytical	Estimating spatial accessibility of public primary health care precisely	To assess accessibility in terms of volume of services provided & the Proximity of services provided relative to the location of the population.	ArcGIS Spatial analyst software module. Universal coverage with the 20 kilometer catchment access area using two methods: Euclidean and travel distance.	Euclidean catchment access method showed 25 % villages were found to be out of catchment area while travel distance method showed 39.7% of the total villages were found to be outside catchment access area.

Discussion

Health care ease of access is the single most important component for equitable and adequate health system. It is also extensively acknowledged as a crucial objective in the direction of recognizing human right for obtaining healthy life. Guaranteeing a healthcare system which is easily accessible to the people has indeed been an ongoing consideration of public health policy makers and related stakeholders [21]. Access to medical care may be described as ability or convenience for patients to get to the health services, while accessibility may be determined as the possible comfort for specified health services or health facilities to be reached and utilized by the patients. Spatial accessibility is evaluation of accessibility determinant which may be chosen according to geological location [22].

As per standard practices, endorsed by WHO, 95 percent of population is supposed to have access to a health care facilities within 30 minute drive time during business day and after hours with 60 minutes travel time [3]. The three common methods of spatial accessibility assessment of primary healthcare are provider-population ratio, travel impedance and gravity model. Although, Provider- population ratio and travel impedance methods are easy to execute but gravity model takes into account the restraint of provider-population ratio and travel impedance and considers the demand and supply factors [22].

Quantifying ease of access to healthcare assists in analyzing the efficiency of healthcare system in an area. Two-step floating catchment area method (2SFCA) is based on population demand and health care supply. It is form of doctor to inhabitant's ratio. In this method Health center (HC) to population (P) ratio is calculated and then accessibility Index of population is estimated [9]. The spatial accessibility results depend on the area of travel region and weightage put on each area for example in every 5km or 10km travel distance [22].

Although, it is generally believed that high income countries have better access to primary health care but there are certain exception to this assumption. A study in New Zealand concluded that central and northern parts of the Otago region have some areas with low accessibility levels to PHC [3]. This study used the same methodology of measuring the accessibility as other studies from low and middle income countries included in this systematic review. Pakistan is ranked as a lower-middle income country and government has declared universal health coverage as its prime program for the health field. It is usually agreed that people' use of healthcare services needs to remain in line with their need for care. However, are no data for Pakistan contrasting accessibility to primary healthcare services [23].

We found that in Afghanistan and South Sudan, 71.2 percent and 71 percent population lived within two hours of travel time and one hour of travel time respectively. In two studies in Mozambique it was found that found 90 percent of area of Mozambique was inaccessible by walking while 67 percent population of Mozambique lived in underserved areas and accessibility to reproductive services were better in southern part. In Bhutan, 10 percent population had good access and in Democratic Republic of Congo 25 percent of population had have an access to nearest facility within two hours by walking. In Indonesia 14 percent had better access while in Bangladesh 40 percent of study population had have better access. Two studies in India showed disparity in the accessibility ranging from 25 to 40 percent of population living outside of catchment access area of health facilities.

In our systematic review, we found that accessibility to primary healthcare was more worse in low income countries like Afghanistan, Mozambique and South Sudan where more than two third of the population lived in underserved or difficult to access areas while rest of the countries, which come under category of lower middle income countries, more than half of the population lived in underserved or difficult to access areas.

The association was found between the regions which have low accessibility to primary healthcare with high number of vulnerable population [22]. Deprived spatial accessibility to health care was established to be].associated with higher disease occurrence, more severe health consequences, and higher demises [24].

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