New Definition of Epilepsy
and
Epidemiology of epilepsy in Africa

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Introduction

Epilepsy is the most common non-infectious (noncommunicable) neurologic disease in Africa

The Definition of Epilepsy

In 2005, the ILAE released a conceptual definition of seizures and epilepsy, followed by an operational (practical) definition in 2014.

Fisher et al. ILAE official report: a practical clinical definition of epilepsy. Epilepsia, 2014; 55:475-82.

Conceptual Definition of Epilepsy

Epilepsy is a disorder of the brain characterized by an enduring predisposition to generate epileptic seizures, and by the neurobiologic, cognitive, psychological, and social consequences of this condition. The definition of epilepsy requires the occurrence of at least one epileptic seizure.

ILAE OFFICIAL REPORT

Epilepsia
The Journal of the International League Against Epilepsy

A practical clinical definition of epilepsy

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Epilepsia, 55(4):475–482, 2014

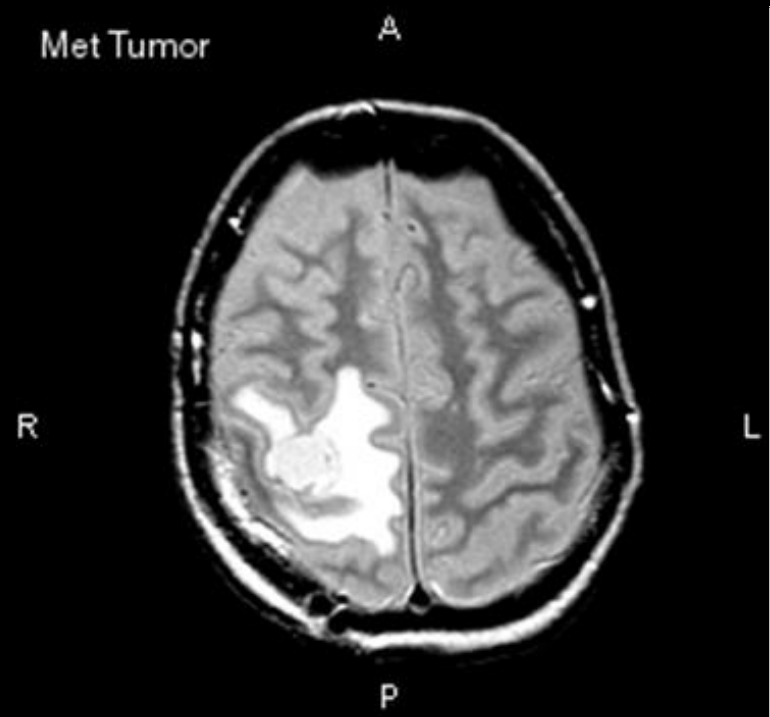
1. A least two unprovoked (or reflex) seizures occurring >24 h apart

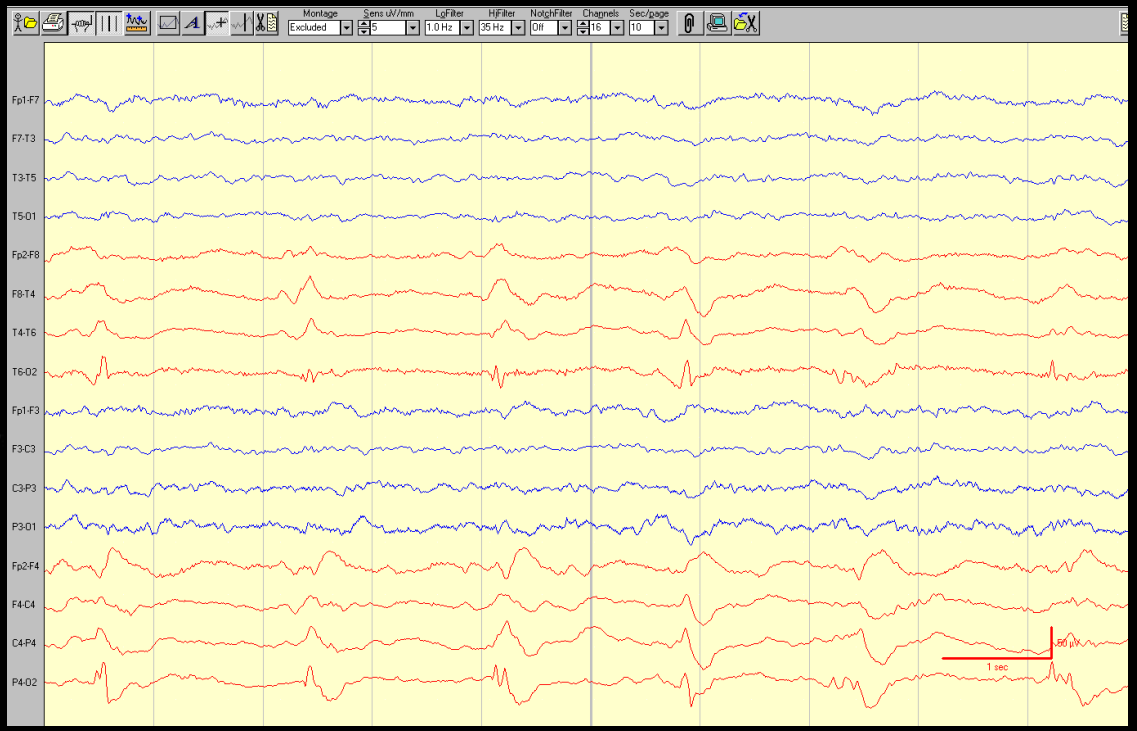
2. One unprovoked (or reflex) seizure and a probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures, occurring over the next 10 years

3. Diagnosis of an epilepsy syndrome

Epilepsy is considered to be resolved for individuals who had an age-dependent epilepsy syndrome but are now past the applicable age or those who have remained seizure-free for the last 10 years, with no seizure medicines for the last 5 years.

- **Some people now are treated as if they have epilepsy after 1 seizure**





Epilepsy Resolved

- Epilepsy is now considered to be resolved* for individuals who had an age-dependent epilepsy syndrome but are now past the applicable age or those who have remained seizure-free for the last 10 years, with no seizure medicines for the last 5 years.

*

Avoiding preconceptions associated with the words “cure” and “remission.”

“Resolved” has the connotation of “no longer present,” but it does not guarantee that epilepsy will never come back

Fisher et al, Epilepsia 55 (4): 475-482, 2014

Reflex Epilepsies

- Despite the fact that seizures are “provoked” in reflex epilepsies, these are considered epilepsy, because…
- If the seizure threshold were not altered, these precipitants would typically not cause seizures
  - e.g., photosensitive epilepsy, eating epilepsy

- “The revised definition places no burden on the treating physician to specify recurrence risk in a particular circumstance.
- In the absence of clear information about recurrence risk, or even knowledge of such information, the default definition of epilepsy originates at the second unprovoked seizure.
- On the other hand, if information is available to indicate that risk for a second seizure exceeds that which is usually considered to be epilepsy (about 60%), then epilepsy can be considered to be present”

Fisher et al, Epilepsia 55 (4): 475-482, 2014

Evidence-Based Guideline: Management of an Unprovoked First Seizure in Adults

Report of the Guideline Development Subcommittee of the American Academy of Neurology and the American Epilepsy Society

A. Krumholz, MD[1,2]; S. Wiebe, MD[3]; G. S. Gronseth, MD[4]; D. S. Gloss, MD[5]; A. M. Sanchez, MD[1]; A. A. Kabir, MD[1]; A. T. Liferidge, MD[6]; J. P. Martello, MD[1]; A. M. Kanner, MD[7]; S. Shinnar, MD, PhD[8]; J. L. Hopp, MD[1]; J. A. French, MD[9]

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Courtesy of Jacqueline French

AAN Guideline

- Adults with an unprovoked first seizure should be informed that sz recurrence risk is greatest early within the first 2 years (21%–45%) (Level A), and **clinical variables associated with increased risk may include:**
  - a prior brain insult (Level A),
  - an epileptiform EEG (Level A),
  - an abnormal CT/MRI(Level B)
  - a nocturnal seizure (Level B).

Courtesy of Jacqueline French

AAN Guideline

- Immediate antiepileptic drug (AED) therapy, as compared with delay of treatment pending a second seizure, is likely to reduce recurrence risk within the first 2 years (Level B)
- **Clinicians' recommendations whether to initiate immediate AED treatment after a first seizure should be based on individualized assessments that weigh the risk of recurrence against the adverse events of AED therapy.**

Courtesy of Jacqueline French

These are not Epilepsy because there is small risk of a seizure in the absence of a precipitating factor

- Febrile seizures in children age 0.5 – 6 years old
- Alcohol-withdrawal seizures
- Metabolic seizures (sodium, calcium, magnesium, glucose, oxygen)
- Toxic seizures (drug reactions or withdrawal, renal failure)
- Convulsive syncope
- Acute concussive convulsion
- Seizures within first week after brain trauma, infection or stroke

ILAE Definition of Acute Symptomatic Epilepsy

Acute symptomatic seizures are events, occurring in close temporal relationship with an acute CNS insult, which may be metabolic, toxic, structural, infectious, or due to inflammation. The interval between the insult and seizure may vary due to the underlying clinical condition.

- Acute symptomatic seizures have also been called:
  - Reactive seizures
  - Provoked seizures
  - Situation-related seizures

Beghi et al. Epilepsia 2010;51:671-675

Courtesy of Dale Hesdorffer

Defining time in acute symptomatic seizures

Events within 1 week of:

- Stroke
- TBI
- Anoxic encephalopathy
- Intracranial surgery
- First identification of subdural hematoma
- Presence of an active CNS infection
- During an active phase of multiple sclerosis or other autoimmune disease

Beghi et al. Epilepsia 2010;51:671-675

Courtesy of Dale Hesdorffer

HYPOTHETICAL CASE: Two seizures

A 25 year-old woman has two unprovoked seizures one year apart.

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Comment: This person has epilepsy, according to both the old and new definitions.

HYPOTHETICAL CASE: Stroke & Seizure

A 65 year-old man had a left middle cerebral artery stroke 6 weeks ago and now presented with an unprovoked seizure.

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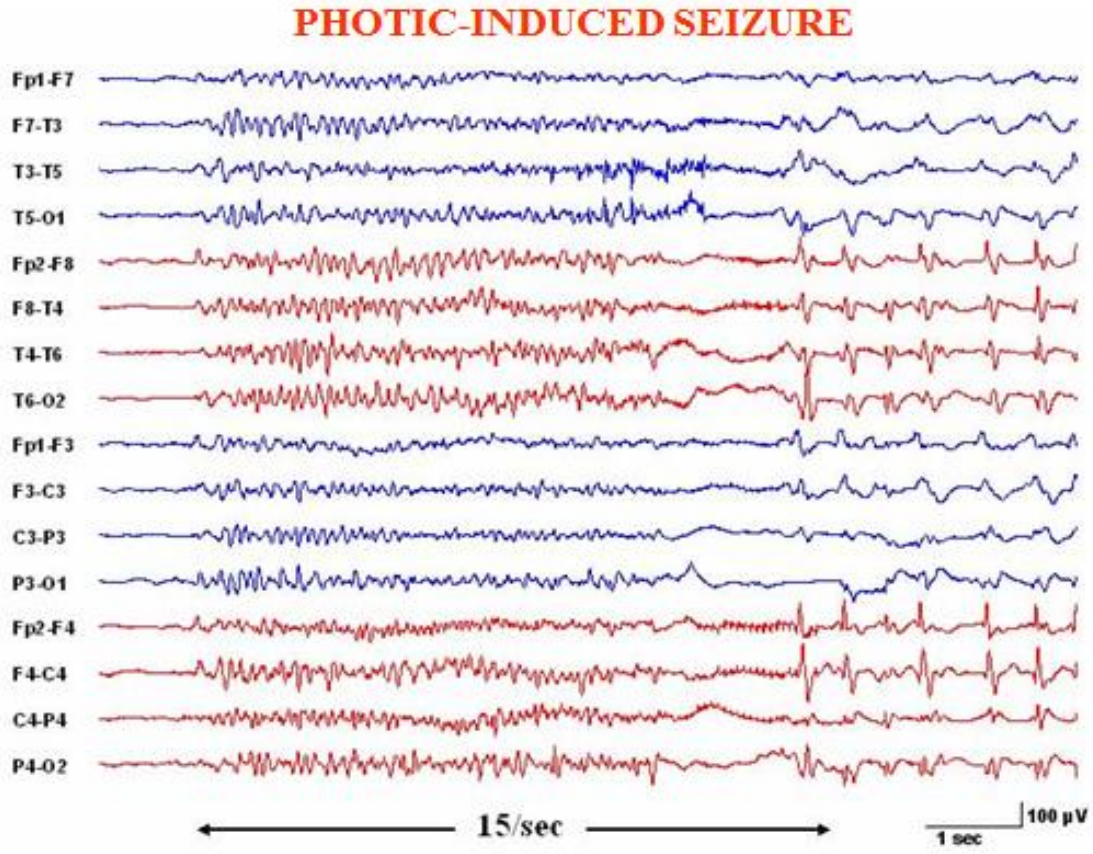
A 65 year-old man had a left middle cerebral artery stroke 6 weeks ago and now presented with an unprovoked seizure.

Comment: With a seizure in this time relation to a stroke (or brain infection or brain trauma) the literature (Hesdorffer et al., 2009) suggests a high (> 70%) risk of another unprovoked seizure. Therefore, in the new (but not the old) definition, this man would have epilepsy.

HYPOTHETICAL CASE: Photic Seizure

A 6 year-old boy has had 2 seizures 3 days apart while playing a videogame involving flashing lights. There have been no other seizures. EEG shows an abnormal photoparoxysmal response.



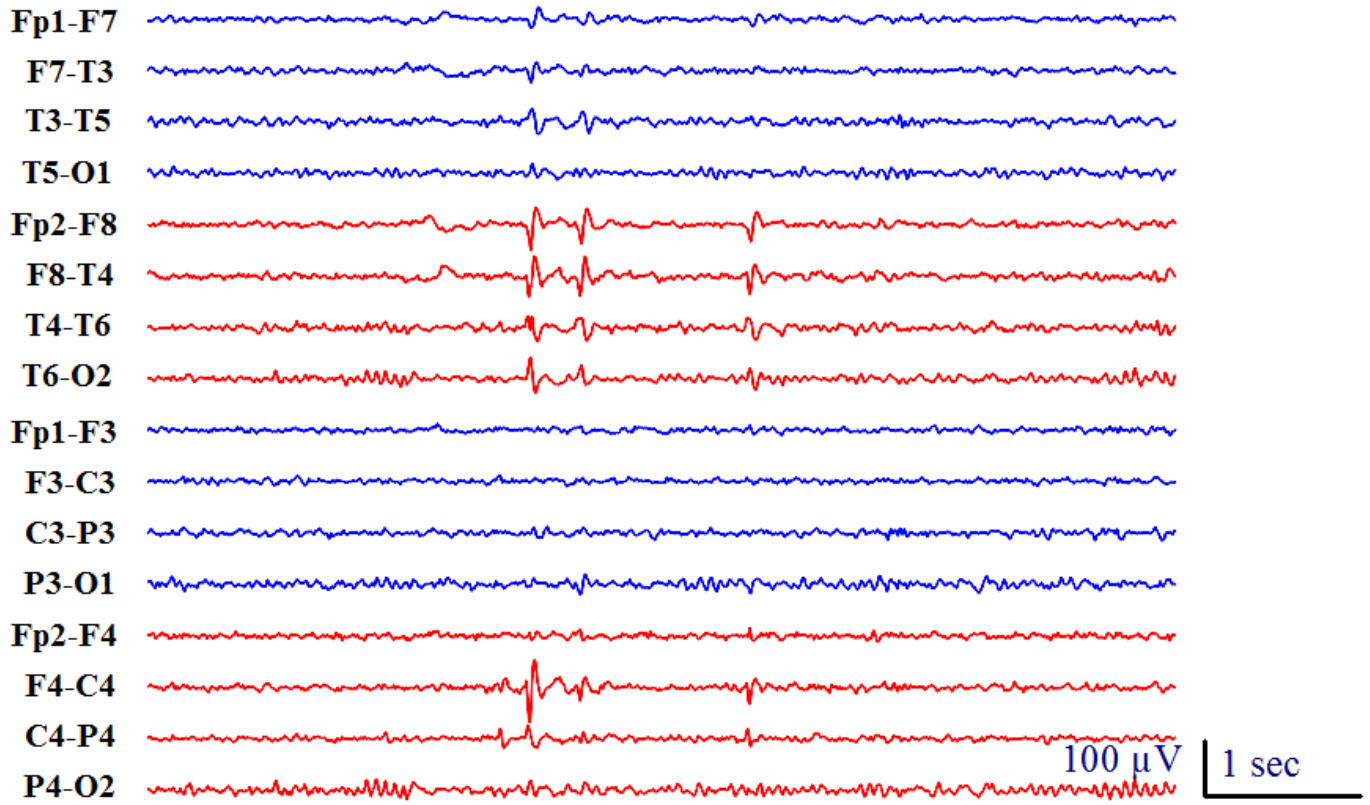
HYPOTHETICAL CASE: Photic Seizure

A 6 year-old boy has had 2 seizures 3 days apart while playing a videogame involving flashing lights. There have been no other seizures. EEG shows an abnormal photoparoxysmal response.

Comment: This boy has epilepsy according to the new definition (but not the old), even though the seizures are provoked by lights, since there is an abnormal enduring predisposition to have seizures with light flashes.

Benign Epilepsy with Centro-Temporal Spikes (BECTS)

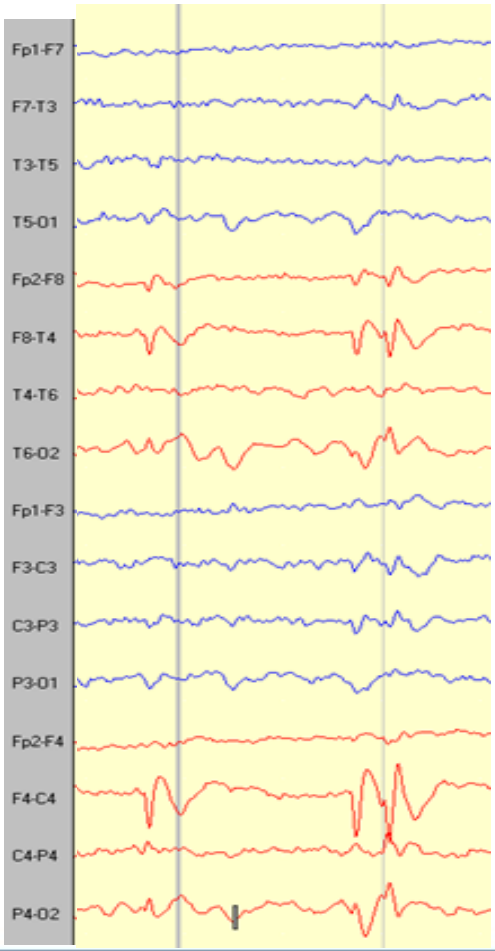
A 25 year-old man had seizures with face twitching when falling asleep at ages 9, 10 and 11 years; none since. EEG at age 9 years demonstrated centro-temporal spikes.



Benign Epilepsy with Centro-Temporal Spikes (BECTS)

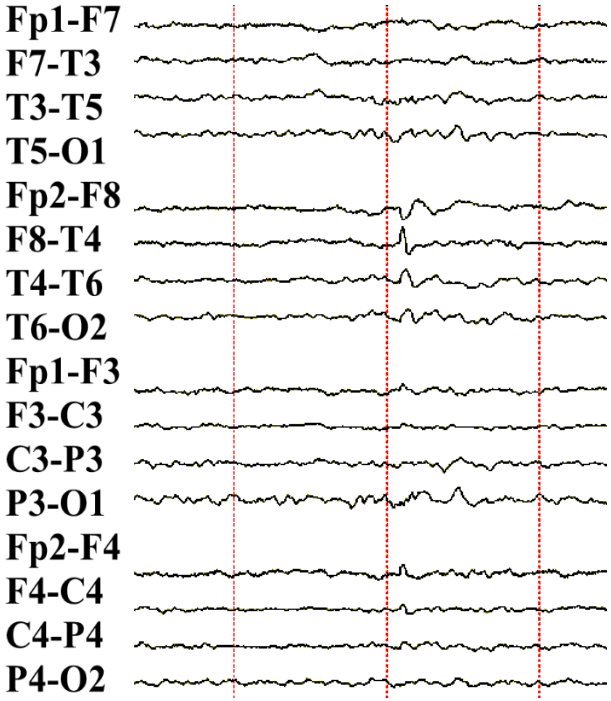
A 25 year-old man had seizures with face twitching when falling asleep at ages 9, 10 and 11 years; none since. EEG at age 9 years demonstrated centro-temporal spikes.

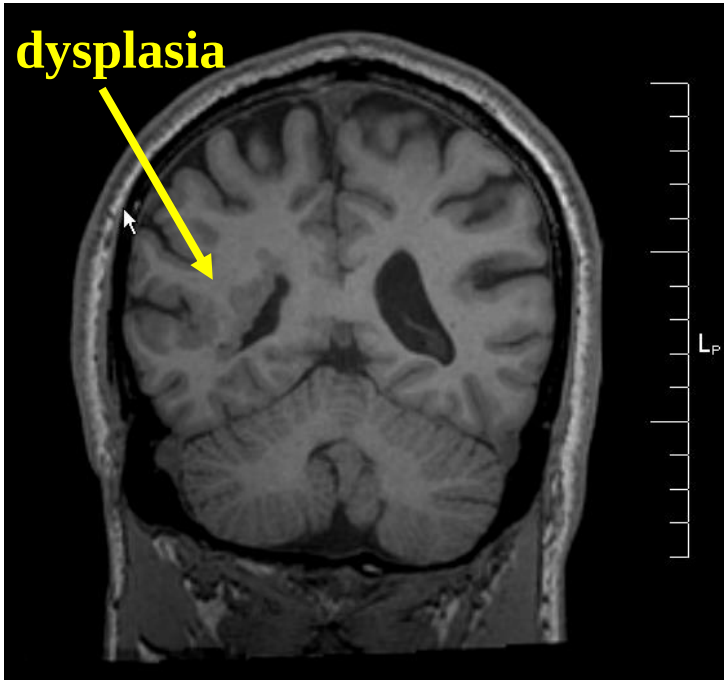
Comment: For this young man, epilepsy is no longer present, because of passing the relevant age range of an age-dependent syndrome. The old definition has no provision for considering epilepsy to be no longer present.



HYPOTHETICAL CASE: Single Seizure & Dysplasia

A 40 year-old man had a focal seizure characterized by left hand twitching that progressed to a tonic-clonic seizure. This was his only seizure. MRI shows a probable periventricular dysplasia in the right frontal lobe and EEG shows right fronto-temporal interictal spikes.





HYPOTHETICAL CASE: Single Seizure & Dysplasia

A 40 year-old man had a focal seizure characterized by left hand twitching that progressed to a tonic-clonic seizure. This was his only seizure. MRI shows a probable periventricular dysplasia in the right frontal lobe and EEG shows right fronto-temporal interictal spikes.

Comment: Although many clinicians would reasonably treat this man with anti-seizure medications, the recurrence risk for seizures is not precisely known, and therefore epilepsy cannot yet be said to be present according to either definition. Should evidence later indicate at least a 60% risk for another seizure, then a diagnosis of epilepsy would be justified by the new definition.

HYPOTHETICAL CASE: Two Seizures Long Ago

An 85 year-old man had a focal seizure at age 6 and another at age 8 years. EEG, MRI, blood tests and family history were all unrevealing. He received anti-seizure drugs from age 8 to age 10 years, when they were discontinued. There have been no further seizures.

HYPOTHETICAL CASE: Two Seizures Long Ago

An 85 year-old man had a focal seizure at age 6 and another at age 8 years. EEG, MRI, blood tests and family history were all unrevealing. He received anti-seizure drugs from age 8 to age 10 years, when they were discontinued. There have been no further seizures.

Comment: According to the new definition, epilepsy is no longer present, since he has been more than 10 years seizure-free and off seizure medication. This is not a guarantee against future seizures, but he has a right to be viewed as someone who does not currently have epilepsy.

HYPOTHETICAL CASE: Long-Interval Seizures

A 70 year-old woman had unprovoked seizures at ages 15 and 70. EEG, MRI and family history are unremarkable.

HYPOTHETICAL CASE: Long-Interval Seizures

A 70 year-old woman had unprovoked seizures at ages 15 and 70. EEG, MRI and family history are unremarkable.

Comment: Both old and new definitions consider this woman to have epilepsy. Despite the diagnosis, many clinicians would not treat because of the infrequency of seizures. Should investigations somehow show that the causes of the two seizures were different, then epilepsy would not be considered to be present.

HYPOTHETICAL CASE: Questionable Information

A 20 year-old man has had 3 unobserved episodes over 6 months consisting of sudden fear, difficulty talking and a need to walk around. He is not aware of any memory loss during the episodes. There are no other symptoms. He has no risk factors for epilepsy and no prior known seizures.

HYPOTHETICAL CASE: Questionable Information

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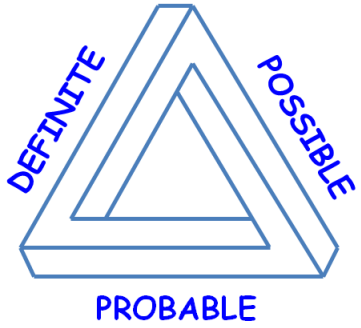
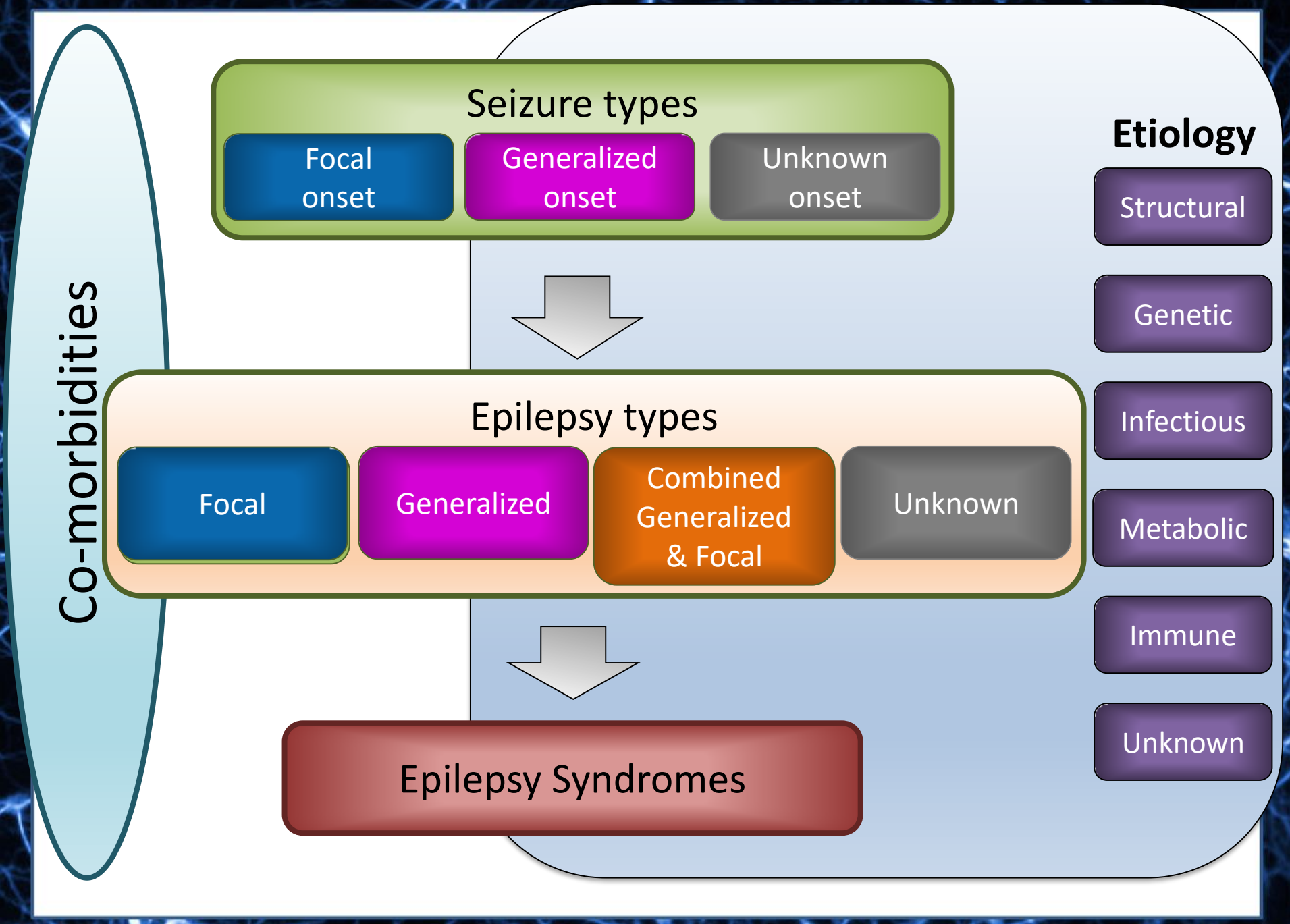


Comment: Declaring this man to have epilepsy is impossible by either the old or new definition. Focal seizures are on the differential diagnosis of his episodes, but both definitions of epilepsy require confidence that the person has had at least one seizure, rather than one of the imitators of seizures. Future discussions may define the boundaries of "possible and probable epilepsy."

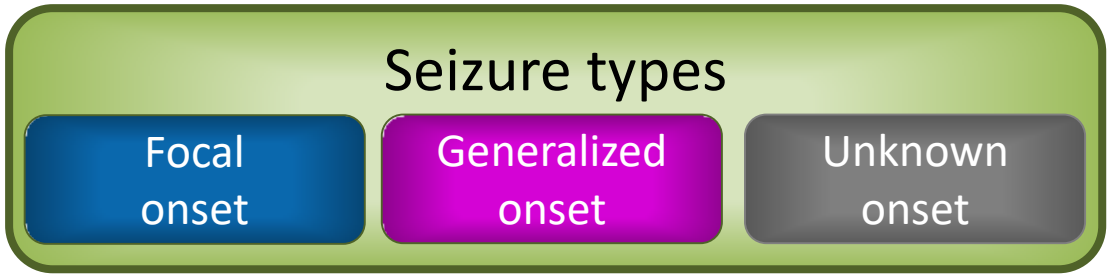
Classification of the Epilepsies

- **Purpose: for clinical diagnosis**


Seizure types
Focal onset
Generalized onset
Unknown onset
Etiology
Structural
Genetic
Infectious
Metabolic
Immune
Unknown
Co-morbidities
Epilepsy types
Focal
Generalized
Combined Generalized & Focal
Unknown
Epilepsy Syndromes

1. Seizure types

- Certain that events are epileptic seizures – **not** referring to distinguishing epileptic versus non-epileptic
- In some settings → classification according to seizure type may be maximum level of diagnosis possible
- In other cases → simply too little information to be able to make a higher level diagnosis
  - eg. when a patient has only had a single event



ILAE 2017 Classification of Seizure Types Basic Version [1]

Focal Onset

- Aware | Impaired Awareness
- Motor Onset
  Nonmotor Onset
- focal to bilateral tonic–clonic

Generalized Onset

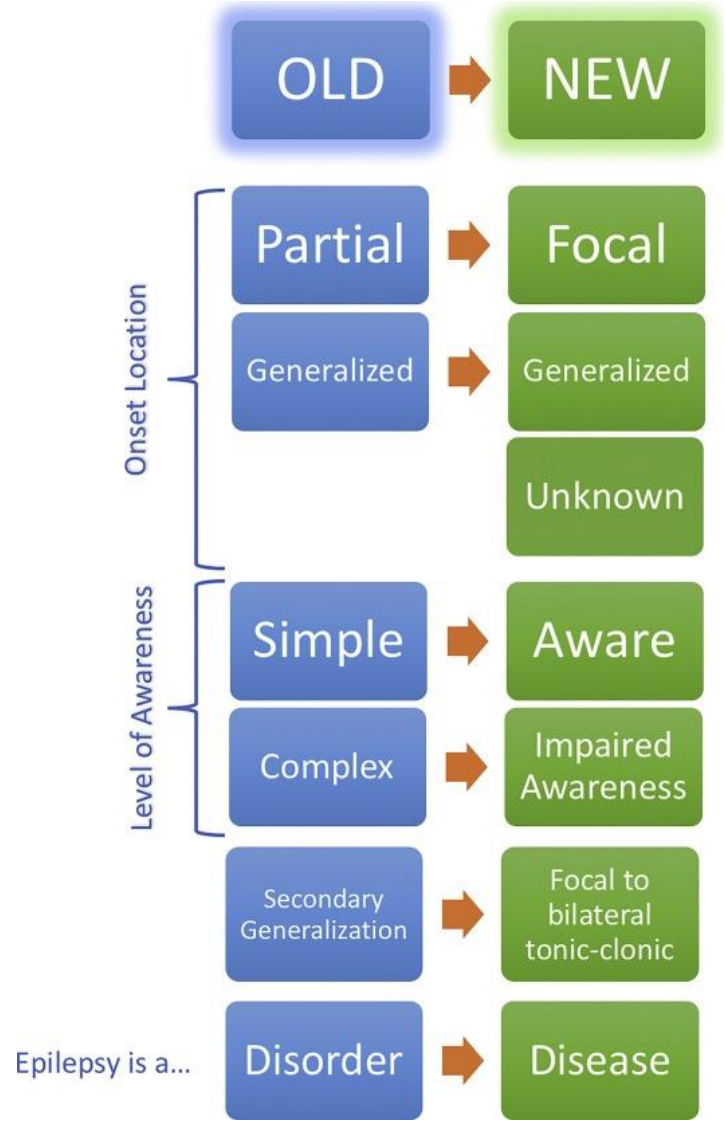
- Motor
  - Tonic–clonic
  - Other motor
- Nonmotor (Absence)

Unknown Onset

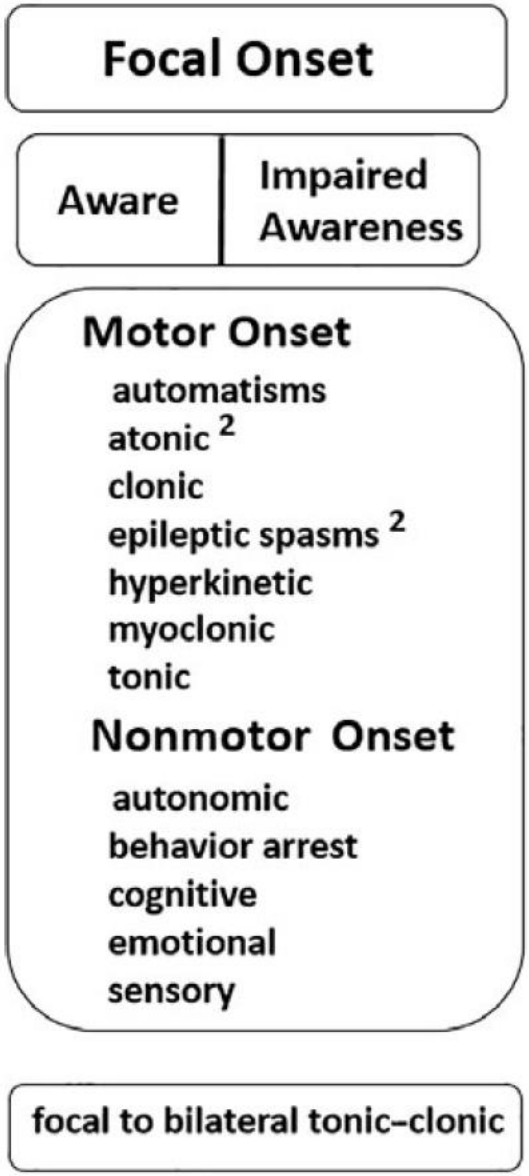
- Motor
  - Tonic–clonic
  - Other motor
- Nonmotor

Unclassified [2]

“Old” Versus “New” classification



ILAE 2017 Classification of Seizure Types Expanded Version [1]



Notes

- Atonic seizures and epileptic spasms would *not* have level of awareness specified
- Pedalling grouped in hyperkinetic rather than automatisms (arbitrary)
- Cognitive seizures
  - impaired language
  - other cognitive domains
  - positive features eg déjà vu, hallucinations, perceptual distortions
- Emotional seizures: anxiety, fear, joy, etc

ILAE 2017 Classification of Seizure Types Expanded Version [1]

Focal Onset

Aware	Impaired Awareness

Motor Onset

- automatisms
- atonic [2]
- clonic
- epileptic spasms [2]
- hyperkinetic
- myoclonic
- tonic

Nonmotor Onset

- autonomic
- behavior arrest
- cognitive
- emotional
- sensory

focal to bilateral tonic–clonic

Generalized Onset

Motor

- tonic–clonic
- clonic
- tonic
- myoclonic
- myoclonic–tonic–clonic
- myoclonic–atonic
- atonic
- epileptic spasms

Nonmotor (absence)

- typical
- atypical
- myoclonic
- eyelid myoclonia

ILAE 2017 Classification of Seizure Types Expanded Version [1]

Focal Onset

Aware	Impaired Awareness

Motor Onset

- automatisms
- atonic [2]
- clonic
- epileptic spasms [2]
- hyperkinetic
- myoclonic
- tonic

Nonmotor Onset

- autonomic
- behavior arrest
- cognitive
- emotional
- sensory

focal to bilateral tonic–clonic

Generalized Onset

Motor

- tonic–clonic
- clonic
- tonic
- myoclonic
- myoclonic–tonic–clonic
- myoclonic–atonic
- atonic
- epileptic spasms

Nonmotor (absence)

- typical
- atypical
- myoclonic
- eyelid myoclonia

Unknown Onset

Motor

- tonic–clonic
- epileptic spasms

Nonmotor

- behavior arrest

Unclassified [3]

ILAE 2017 Classification of Seizure Types Expanded Version [1]

Focal Onset

Aware	Impaired Awareness

Motor Onset
- automatisms
- atonic [2]
- clonic
- epileptic spasms [2]
- hyperkinetic
- myoclonic
- tonic

Nonmotor Onset
- autonomic
- behavior arrest
- cognitive
- emotional
- sensory

focal to bilateral tonic–clonic

Generalized Onset

Motor
- tonic–clonic
- clonic
- tonic
- myoclonic
- myoclonic–tonic–clonic
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Nonmotor (absence)
- typical
- atypical
- myoclonic
- eyelid myoclonia

Unknown Onset

Motor
- tonic–clonic
- epileptic spasms

Nonmotor
- behavior arrest

Unclassified [3]

Note

When a seizure type begins with ”focal, generalized or absence” then the word “onset” can be presumed

Terms no longer in use

- Complex partial
- Simple partial
- Partial
- Psychic
- Dyscognitive
- Secondarily generalized tonic-clonic

https://www.epilepsydiagnosis.org

> Overview

Log In For Videos

- Overview
  - Log In for Videos
  - Give Feedback
- Seizure Classification
  - Generalized seizures
  - Focal seizures
  - Focal/Generalized
- Epilepsy syndromes
  - Neonatal/Infantile
  - Childhood
  - Adolescent/Adult
  - Variable Age
- Epilepsies by Etiology
  - Genetic
  - Structural
  - Metabolic
  - Immune
  - Infectious
  - Unknown

EpilepsyDiagnosis.org

The ILAE Commission on Classification and Terminology welcomes you to EpilepsyDiagnosis.org, a cutting edge online diagnostic manual of the epilepsies.

Goal

The goal of ***epilepsydiagnosis.org*** is to make available, in an easy to understand form, latest concepts relating to seizures and the epilepsies. The principle goal is to assist clinicians who look after people with epilepsy anywhere in the world to diagnose seizure type(s), classify epilepsy, diagnose epilepsy syndromes and define the etiology of the epilepsy. The site is principally designed for clinicians in primary and secondary care settings caring for people with epilepsy and we hope will also serve as a useful teaching aid.

Structure

The structure of this site reflects the importance of seizure type, syndrome, and etiology in clinical practice. On this website, you will find current classification concepts for seizures, with their clinical features, video examples, EEG correlate, differential diagnosis and related epilepsy syndromes. Epilepsy syndromes are detailed by their clinical features, seizure types, EEG, imaging and genetic correlates and differential diagnoses. The site includes sections on etiologies of epilepsies and epilepsy imitators with cross-referencing between these sections and seizure and syndrome sections.

Definition of epilepsy

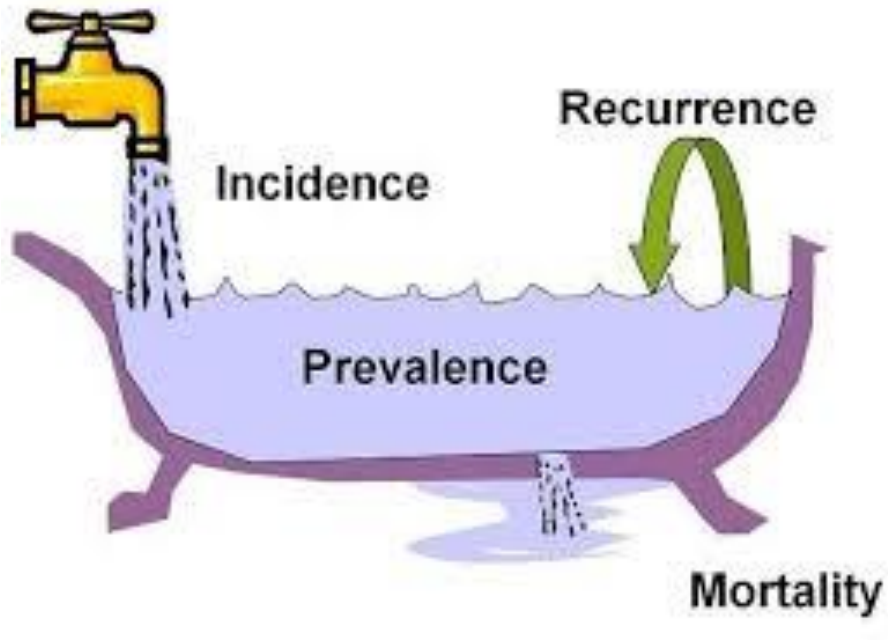
Epilepsy is a disease of the brain defined by any of the following conditions:

- At least two unprovoked (or reflex) seizures occurring more than 24 hours apart

Epidemiology of Epilepsy in Africa

Incidence and Prevalence

Incidence : the rate of new (or newly diagnosed) cases of the disease. It is generally reported as the number of new cases occurring within a period of time (e.g., per month, per year).



Prevalence is the actual number of cases alive, with the disease either during a period of time (period prevalence) or at a particular date in time (point prevalence).

Characteristics of Sub-Saharan Africa

- **54** countries
- Population : 960 million (2016)
- Young population, > rural regions.
- 36% urban regions, > poverty
- average life expectancy at birth : 46.
- Under 5 infant mortality : 164/1000 infants
- Access to safe water: 46% of rural pop.
- access to sanitation: 55%

Incidence

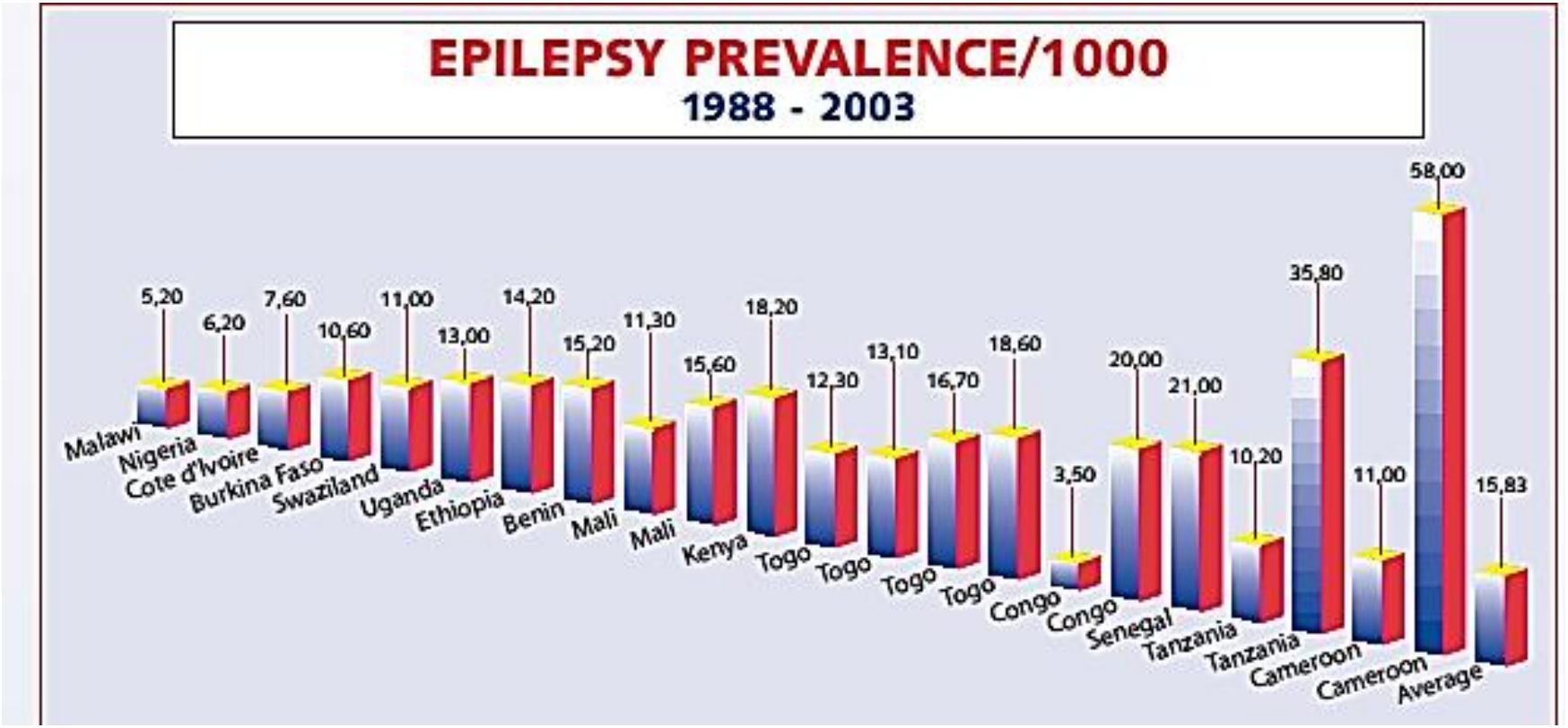
- Data collection is a problem.
- Few incidences studies performed, rates have ranged from 63 to 158 per 100 000 per year.

Country	Authors	Year	Population size	Incidence (per 100 000)
Controlled and published studies				
Burkina Faso	Debouverie et al.	1993	16 627	83
Ethiopia	Tekle-Haimanot et al.	1997	61 686	64
Tanzania	Rwiza et al.	1993	16 635	73
Togo	Grunitzky et al.	1991	19 241	119
Uganda	Kaiser et al.	1998	4 389	156
Unpublished reported data				
Algeria	Mait-Kaci	1978	30 000	56

Prevalence

- Is extremely variable
- Rates have ranged from 5,2 to 58%.
- Based on the methodology used
- Median prevalence rate is 11%
- With lowest rate 2,2% in South Africa
- Highest rates over 15% mainly in rural areas

Epilepsy – World health Organisation



COUNTRY LOCATION	PREVALENCE RATES/1000	INVESTIGATOR
Congo	4	Piraux (1960)
Bantus, South Africa	4	Bird *et al* (1962)
Ghana	4	Haddock (1973)
Uganda	4	Orley (1970)
Zimbabwe	7.4	Levy *et al* (1964)
Ethiopia (Rural)	8	Giel (1968)
Ethiopia (Urban)	5	Giel (1968)
Senegal	3 – 8	Collomb *et al* (1970)
Tanzania	1	Smartt (1959)
Tanzania	20	Jilek & Jilek (1970)
Kenya	10 - 18	Miyangi (1995)
Nigeria Urban	8 – 13	Dada (1970)
Nigeria Rural	5.3	Osuntokun(1987)
Nigeria Rural	6.2	Longe and Osuntokun(1989)

Épidémiologie de l'épilepsie en Afrique subsaharienne : une revue de la littérature*

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Tableau 1. Études de l'incidence de l'épilepsie en Afrique subsaharienne.

Table 1. Studies on the incidence of epilepsy in sub-Saharan Africa.

Année	Auteurs [réf]	Pays	Population étudiée		Incidence / *100 000* par an	*Sex/ratio* (M/F)	Type d'enquête
1998	Kaiser *et al.* [2]	Ouganda	4	389	156	1,2	T
1991	Grunitzky *et al.* [3]	Togo	19	241	119	ND	R
1993	Debouverie *et al.* [4]	Burkina Faso	16	627	83	1,7	R
1992	Rwiza *et al.* [5]	Tanzanie	16	635	73	ND	R
1997	Tekle-Haimanot *et al.* [6]	Éthiopie	61	686	64	1,2	T

R = enquête rétrospective ; T = enquête transversale ; ND = non disponible.

Electronic supplementary material:
The online version of this article contains supplementary material.

journal of global health

An estimate of the prevalence of epilepsy in Sub–Saharan Africa: A systematic analysis

Abigail Paul[1], Davies Adeloye[1],
Rhiannon George-Carey[1],
Ivana Kolčić[2], Liz Grant[1]
Kit Yee Chan[3,4]

Results Active epilepsy was estimated to affect 4.4 million people in Sub–Saharan Africa, whilst lifetime epilepsy was estimated to affect 5.4 million. The prevalence of active epilepsy peaks in the 20–29 age group at 11.5/1000 and again in the 40–49 age group at 8.2/1000. The lowest prevalence value of 3.1/1000 is seen in the 60+ age group. This binomial pattern is also seen in both men and women, with the second peak more pronounced in women at 14.6/1000.

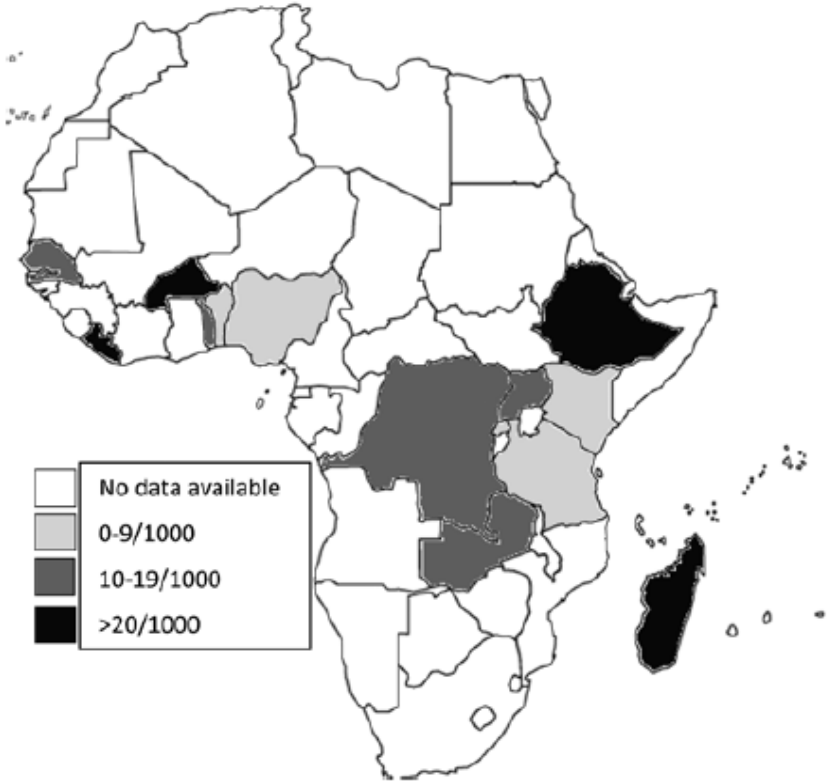


Figure 2 Map showing the prevalence of epilepsy by country in Sub–Saharan Africa (adapted from http://www.worldatlas.com/webimage/countrys/africa/afoutl.htm).

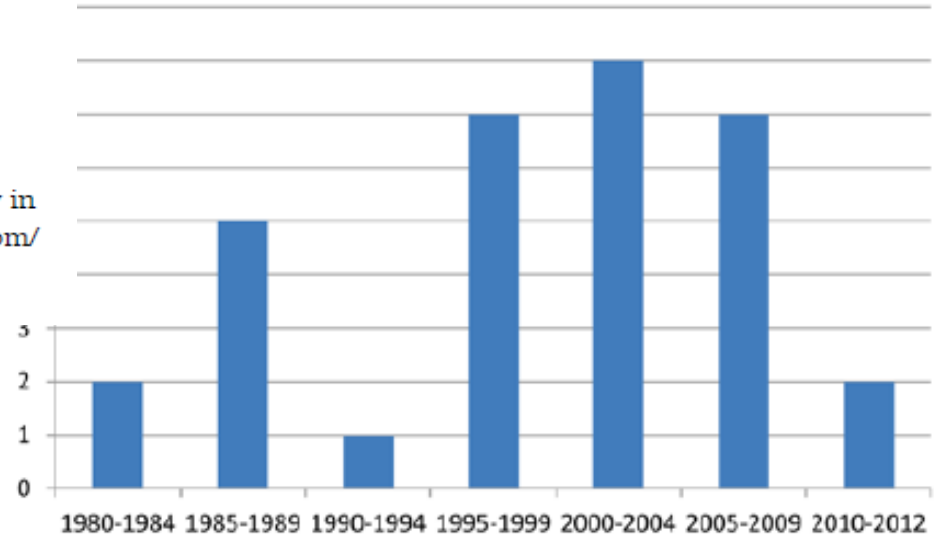


Figure 3 The distribution of studies according to the year of publication.

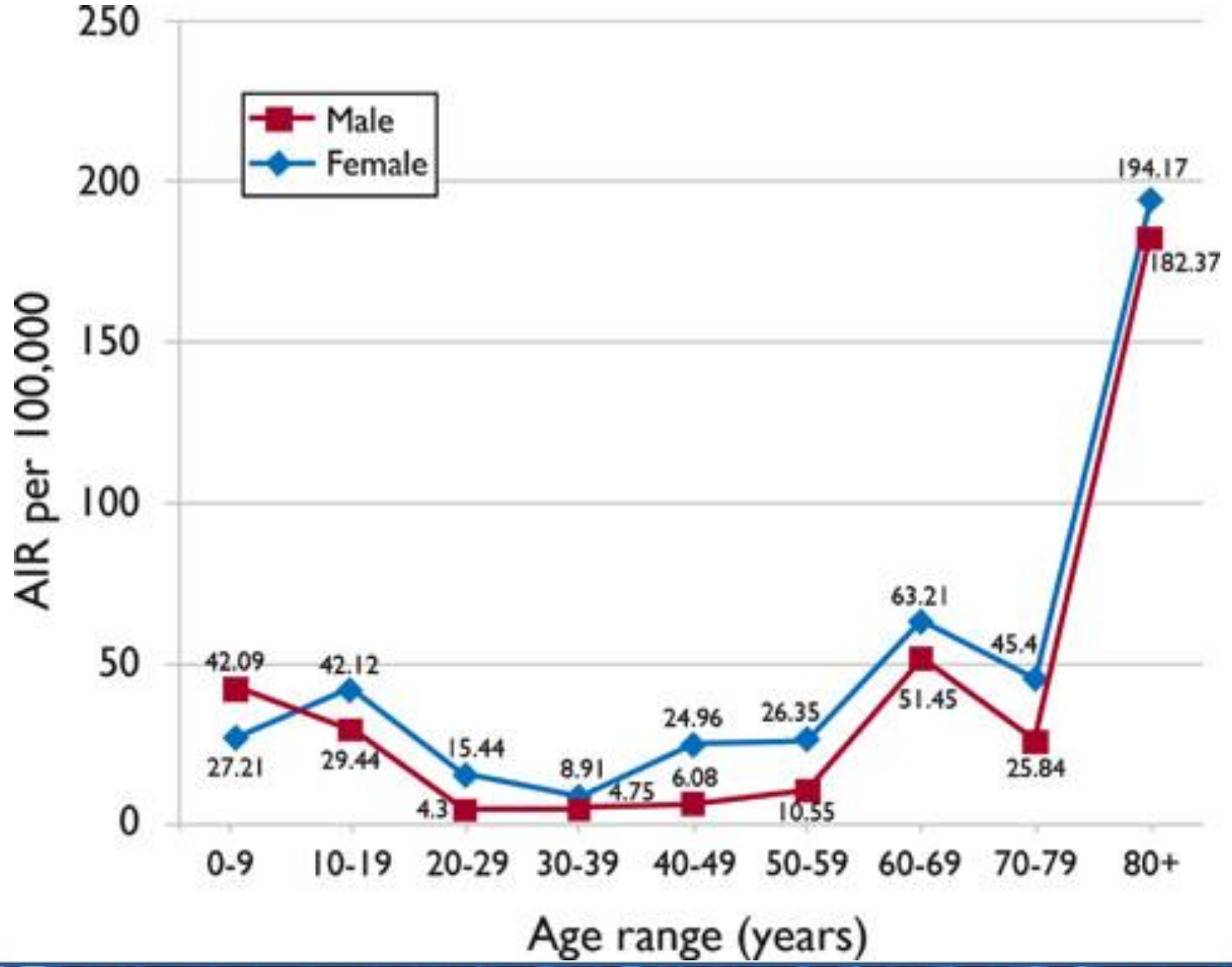
Prevalence of active convulsive epilepsy in sub-Saharan Africa and associated risk factors: cross-sectional and case-control studies

Anthony K Ngugi, Christian Bottomley*, Immo Kleinschmidt, Ryan G Wagner, Angelina Kakooza-Mwesige, Kenneth Ae-Ngibise, Seth Owusu-Agyei, Honorati Masanja, Gathoni Kamuyu, Rachael Odhiambo, Eddie Chengo, Josemir W Sander, Charles R Newton, for the SEEDS group*

Interpretation The prevalence of active convulsive epilepsy varies in sub-Saharan Africa and that the variation is probably a result of differences in risk factors. Programmes to control parasitic diseases and interventions to improve antenatal and perinatal care could substantially reduce the prevalence of epilepsy in this region.

Lancet 2013

Annual incidence rate of Epilepsy (worldwide)



Age-specific prevalence and age at onset of active convulsive epilepsy in the five centres

Lancet 2013

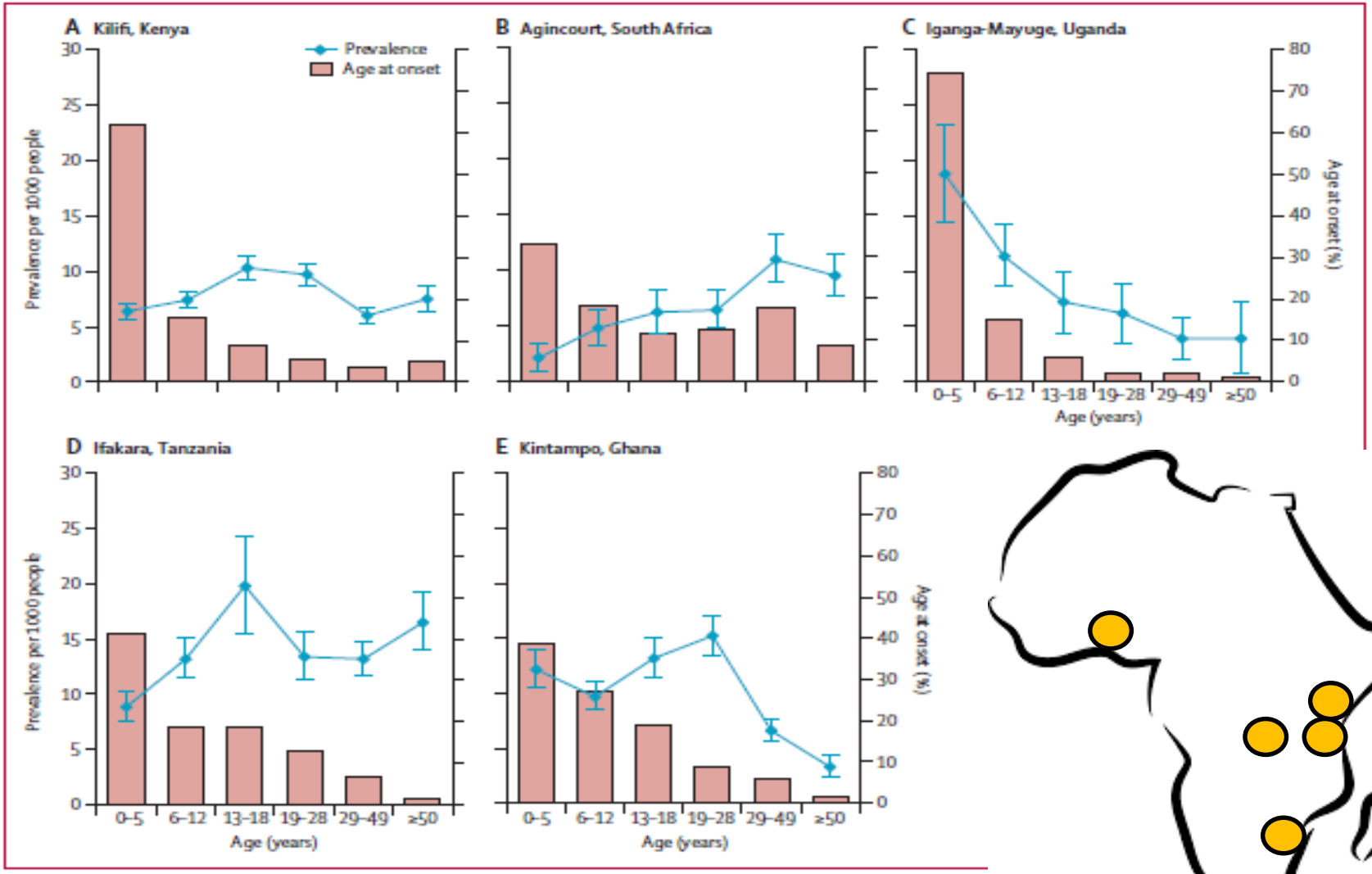


Figure: Age-specific prevalence and age at onset of active convulsive epilepsy in the five centres

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Epidemiology, causes, and treatment of epilepsy in sub-Saharan Africa

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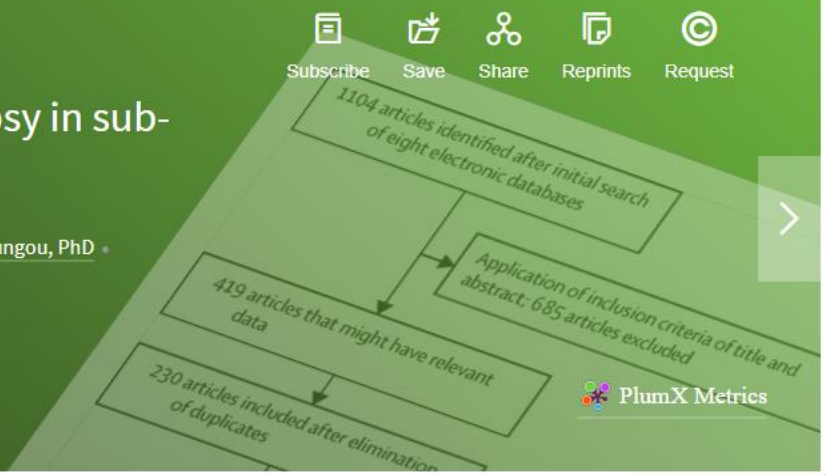

	Year	N	Incidence (95% CI)*	Sex ratio (M/F)	Proportion aged <20 years	Type of study
Ethiopia[21]	1997	61 686	64·0 (44–84)	1·2	79·0%	Prospective
Benin (Djidja)[22]	2013	11 668	69·4 (30–137)	0·9	NA	Prospective
Tanzania[23]	1992	18 183	73·3 (34–113)	0·9	60·8%	Retrospective
Tanzania[24]	2009	7399	81·0 (65–101)	1·0	59·1%	Prospective
Burkina Faso[25]	1993	16 627	83·0 (40–126)	1·7	76·2%	Retrospective
Uganda[26]	1998	4389	156·0 (145–166)	1·2	97·5%	Prospective
Kenya[27]	2008	10 218	187·0 (133–256)	1·0	NA	Prospective
Kenya[28]	2013	623 004	77·0 (68–87)	0·9	54·5%	Retrospective

NA=not available. *Per 100 000 person-years of follow-up.

Table 1: Studies of the incidence of epilepsy in sub-Saharan Africa

Reasons for expected higher prevalence and incidence of epilepsy

- Inadequate ante- and peri-natal care (high rates of perinatal brain trauma)
- Infectious burden (malaria, onchocerciasis, cysticercosis, HIV, other viruses etc)
- Under - /Mal-nourishment
- Road traffic accidents/ other causes for head injury
- Growing burden of cerebrovascular disease
- Ageing populations with increasing incidence of neurodegeneration.

Solutions to the data and treatment gap

- Education of primary healthcare providers
- Training of medical personnel in epilepsy care
- Education of the general population on epilepsy and related disorders – in order to change health seeking behaviour
- Accurate data collection, storage and analysis
- Cooperation with regional and other international bodies to promote good clinical practices in neurological care provision
- NO health Without BRAIN health
- Creation of regionally appropriate treatment guidelines to reduced the treatment gap

mhGAP

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