



Writing skills and proposal outline

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Why is it important to write well?

- Present your research findings
- Communicate research findings
- Write a good thesis and progress in research career
- Publish research findings
- For peer-review
- **WRITE GRANT APPLICATIONS**



Writing style



- No spelling mistakes
- Grammatically correct
- Meets the formatting guidelines
- First person- What do you intend to do?
- No personal anecdotes or stories - simply present the facts
- Write a compelling story

Word choice



- Verbs are important in science writing

Examine and Analyze

Examine- an activity to gain knowledge

Analyze- describing the analysis of that knowledge

Examine a scene to find facts- then analyse the facts to draw conclusions

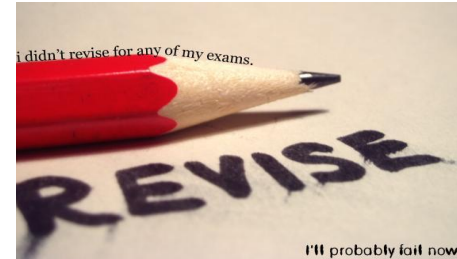
- This is important in stating the thesis or hypothesis
 - Is the purpose to examine the relationship between 2 variables or to analyze it?
- Word choice can make the difference between a good and a great paper.

Short, sharp and clear sentences

A^{void} to W^{ords}

'An accurate estimate'	Implies complete freedom from error "a reliable estimate"
'carried out'	Colloquial Conducted, performed, was studied
'during the course of', 'in the course of'	'During' and 'in' will suffice
'Felt' (it was felt that)	One feels cloth, but leaves ideas
'However, because' or 'However since'	Do not use with another conjunction
Partially, Partly	Implies bias in favour of one/ other, More precise portion/ proportion
Varying, various, different, differing	Commonly misused as synonyms
Where	Implies locality, used as synonym for 'in which'

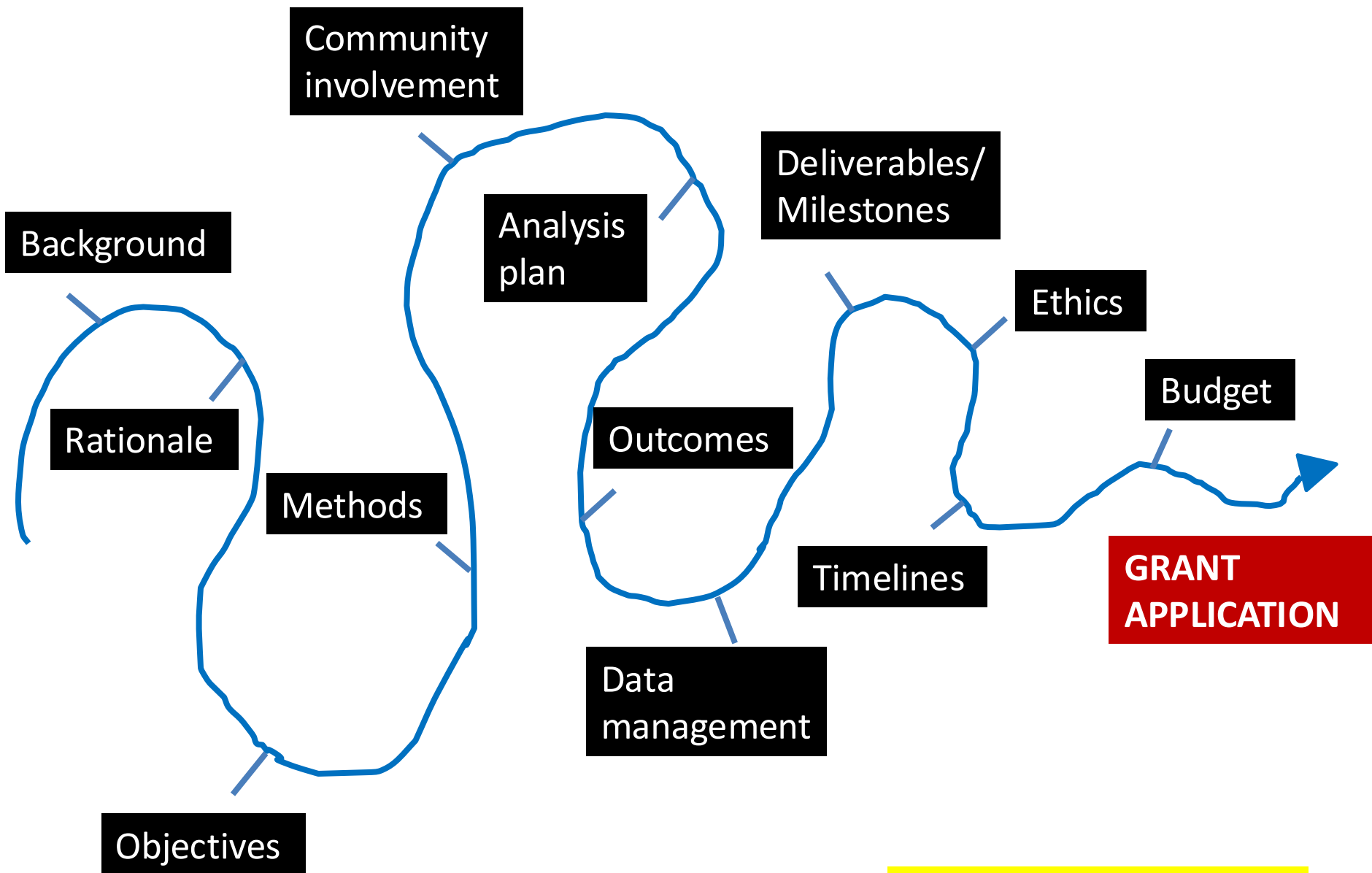
Writing clear English



- Concise
- Does your sentence say what you want it to tell the reader?
- Does your sentence or paragraph have too many thens, ands, thats, thereforees?
- Are you going on and on and on and on and not saying anything?
- Is there a better or clearer way to say what you want?
- Are the commas and other punctuation in the right place?
- Make sure it is not spoken English in the text.
- Have you introduced the abbreviation (abbr)? Do this early on and keep with the same abbr



Story thread



Processing time = 1 year

Examples I

The elimination or management of vector borne diseases has been a area of intense research focus for many years.

This was a multisite diagnostic evaluation study which aimed at evaluating a new approach to diagnosing febrile illnesses

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While working on a set of possible hypotheses, this study proposes a computational approach of determining the possible causes of SOLEXA/Illumina-generated short read sequence non-alignment to the reference genome.

It is also typical in ChIP-Seq data analysis to use uniquely mapped reads for identification of enriched genomic regions, and this can significantly reduce the fraction of reads used in the analysis, since almost half the number of reads can map to multiple genomic regions, at least in plant genomes like *Arabidopsis thaliana*, *Oryza sativa* and *Zea mays*

Examples II

Due to the heavy burden of vector-borne diseases, the development of sustainable methods of control is important as ever.

Due to the ~~heavy burden~~ of vector-borne diseases, the development of sustainable methods of control is very important.

An examples of polymorphic microsporidia is *Edhazardia aedis* a pathogen of *Aedes aegypti*, that has a high level of host specificity and causes male larval mortality but does not have major effects on adult fitness.

It is not known whether the observed phenomenon of short read sequence non-alignment is genome specific or comparable across major eukaryotic genomes. This study aims to carry out an exhaustive analysis of these unaligned reads with a view of identifying alignment trends across different plant and animal genomes and deciphering whether any biological relevance is inherent in such unaligned reads





GUIDELINES

1. Understanding the call you are applying for
 2. Read it in detail and make notes or highlight all the sections of the application that will be required to complete the application- including supporting letters from other etc
- Font- Times New Roman
 - Font size 12
 - Double spacing or single spacing
 - Maximum of words (excluding title page, supervisors signature page and references)
 - Include page numbers
 - Submit 24 hours before the deadline

Introduction



- Literature review/ Background to the work
- Literature relating to the work you intend to pursue
- Lead you to your rationale and
- Research question
- Objectives of the study

General structure: Broad Topic-Narrow Topic- Hypothesis-Purpose of this study-Implications/Impact

Introduction

- Length can vary, but structure and content is similar
- What to do in this section: **(set the scene)**
 - Present the problem the research will address
 - Why the problem is important
 - How does it apply to the larger field of research
 - Clearly state hypothesis
 - Address relevant studies by other researchers (full history of topic not required)

Intro cont...

- Provides the reader with all the information required to understand the paper.
 - Summarize the problem to be addressed
 - Give background on the subject
 - Discuss previous research done on the topic
 - Explain exactly what the paper will address, why and how.
- Needs to contain all the background information for the reader to understand the rest of the paper
 - Explain all important concepts
 - Define important terms

1. Broad topic: problem and background

- Use a paragraph to state the problem and give background on that problem.
- At the end of the paragraph the reader should know the broad topic the paper will address

From Jiang et al., 2008

*“The identification of *pfcr*t as the key gene associated with chloroquine resistance (CQR) [1,2] is one of the most important advances in our understanding of antimalarial drug resistance. Polymorphisms in the *pfcr*t gene were demonstrated to confer CQR using both drug selection and genetic transformation [1,3,4,5,6]. A lysine to threonine substitution at position 76 (K76T) has been found in every in vitro-tested CQR parasite from worldwide surveys of field isolates [7,8]. However, the molecular mechanism of the PfCRT effect on parasite susceptibility to CQ remains controversial [9].”*

2. Narrower topic: problem and background

- **Home in** on the specific problem the paper will address. This should be done as bluntly as possible. E.g. ‘This study examines’ or ‘This paper focuses on’
- Then in the next several paragraphs the author should **discuss the narrowed topic** and must include the following:
- **Clear statement of the hypothesis** – the “If-Then” statement that underlies the author’s whole study
- Previous research- summarize the results and findings of other studies in the area. What research has been done? How will this study differ? What other studies on similar topics might influence this study?

3. Motivation for Research

- The final paragraph should be a summary of **‘Why should we care?’** **Why is the research important?** Why is this problem important? How will answering this problem advance research in this area, in industry, in policy or in people’s lives?

“CQR parasites have spread from as few as five origins to their current nearly global distribution, drastically altering the genomic landscape of malaria parasites [8]. While much effort has focused on understanding how key mutations in PfCRT produce CQR, strikingly little is known about the genetic background of CQR, the natural function of PfCRT and its molecular partners in the basic biology of the parasite.”

Define goals, objectives

- Goals and objectives same thing?
- Goal the big question you want to solve- the WHAT?
- Objectives- the HOW you will do it?
 - These need to be clear, SMART
 - Feasible
 - Connected/incremental

Examples v1

1. To determine the transmission networks of DENV and CHIKV outbreaks and the potential of these rapidly evolving viruses to escape host immunity and evade vaccination and vector control;
2. To monitor the emergence and transmission of multidrug-resistant *Kp* in hospital and community settings, and its response to alternative drug regimens and interventions to reduce carriage;
3. To assess the transmission and amplification of multidrug resistance (MDR)-MTB following treatment semi-empirically across Africa and Southeast Asia using different MDR-TB treatment regimens.

Examples v2

Overall objective

Developing multi-pathogen genomic epidemiology to determine the transmission networks and the emergence and escalation of pathogen variants that define outbreaks and the potential to escape treatment, host immunity and vaccination.

Specific objectives:

1. To coordinate and synergize the strengths across AAPs/CIDRI-A and data integration across all work packages.
2. To determine the transmission networks of CHIKV and DENV outbreaks and the potential of these rapidly evolving viruses to escape host immunity and vaccination.
3. To determine the emergence and transmission of multidrug-resistant *Kpn* in hospital and community settings.
4. To determine the emergence of resistance to bedaquiline, pretomanid, linezolid and moxifloxacin among rifampicin resistant Mtb strains.



Common mistakes

- **Too much information-** include unnecessary information in the introduction that is not relevant.
'Trager and Jenson 1976 enabled the maintenance of parasites in continuous culture in human erythrocytes incubated at 38°C. Thus allowing for the development of CQ resistant clones for analysis of mutations in pfprt.'
- **Not enough information-** do not assume the audience knows more than you, explain concepts, provide background information and discuss enough previous studies. Make yourself clear.
 - Strike a careful balance between superfluous explanations and not enough information

No reference to the figure in the text

Demographic and climate change have been linked to the re-emergence and spreading of several vector-borne diseases (VBDs). These diseases are a huge burden to the world and Africa in particular. Insect-transmitted diseases cause over 1 million deaths annually and account for 17% of infectious diseases (WHO, 2013). Mosquitoes are amongst the most significant vectors of VBDs.



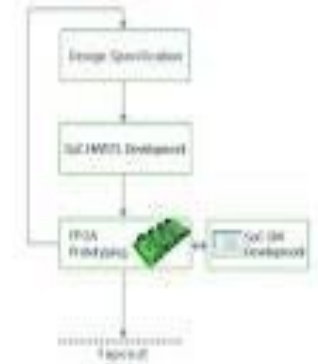
Figure 1: Vector Borne disease Global burden: Image adapted from WHO Health report, 2004



Common mistakes cont...

- **Unclear what the study is-** having a thorough background, but it is unclear what the paper focuses on. Blunt statement to say what the paper will cover, how and why.
- **Lists** – listing material in paragraph or bullet format. Describe your study in continuous prose
- **Confusing structure-** all sorts all of information all over the place. Think through the organization of the introduction before you start writing, otherwise the readers will be confused.
 - Structure outline: Big problem-my portion of that big problem-hypothesis (logic underlying my study)-description of my study-why the reader should care about this study.

Study Design/ Methodology



- What will you do?
- How will you do it?
- What is required to allow you to do it?

For example:

Water samples of 50ml will be collected from 50 ponds in the Central region of Kenya, during the month of May at the end of the rainy season. The water samples will be analysed for micro-organisms that inhabit each pond using microscopy.

Methods

- Reagents used (company name)
- Reference to other methodologies, summarise the process
- Populations defined
- Location of work
- Age, range, time frames
- Statistics used and how?
 - Logistic regression, multiple testing, simulations

State as facts in short sentences

Examples

Mosquito collections were done from 1st to 5th June 2015 using cattle baited-traps and CDC-light traps.

Universal primers targeting 313bp were designed after comparison and alignment of partial *rpoB* sequences of the different *Spiroplasma* species

Sequence homology search was checked by performing a blast in NCBI to ensure site-specificity of the primer.

Samples were amplified in a two-step process that involved 25ul reaction using Qiagen Hotstart taq mastermix mix (Qiagen Inc, Valencia, California), 1ul of each 5uM primer, and 1ul of template. Reactions were performed on ABI Veriti thermocyclers (Applied Biosystems, Carlsbad, California). The PCR cycling conditions included; 95°C for 5 min, then 25 cycles of 94°C for 30 sec, 54°C for 40 sec, 72°C for 1 min, followed by one cycle of 72°C for 10 min and 4°C hold.

Errors a reviewer NEVER wants to see

- Degrees use the right symbol - °C
- Italicise latin names- *Anopheles gambiae* or *Anopheles spp.* or *A. gambiae* NOT Anopheles gambiae
- Enzymes –Taq polymerase NOT taq
- 2µl NOT 2ul or 2 ul
- Centrifuge at 3000 x g NOT 3000 rpm
- SPELLING MISTAKES
- Reduce grammatical errors



Common mistakes

- Not enough detail
- Procedures missed out
- Verbosity
- No statistics
- No information on where study is conducted
- Ethical clearance not mentioned

Ethical clearance



- Have you received ethical approval for your work?
- If so from who?
- If no ethical approval is required then state that the work does not require ethical approval.
- NB. Any work that uses human samples even data generated by someone else you must state that ethical approval was received and from where

Data management and sharing plan

a) Data management

Patient clinical and location data is securely stored on a local, backed up, password protected server at KWTRP.

The competition ELISA data generated from the Synergy 4 multimode microplate reader and from the flow cytometer, FC500 Series Beckman Coulter, for the invasion assays are routinely backed up on the KWTRP server.

The next-generation sequencing data which will be analysed on the Galaxy platform is on a 16 core dedicated bioinformatics server. All data management and statistical analysis will be conducted using STATA or R (freely available on www.r-project.org).

b) Data sharing

The sequence, ELISA and invasion assay data will be made public on publication in a peer reviewed open access journal of the manuscript. The sequence data will also be submitted to the NCBI public sequence database. The data will be shared with the international scientific community through regular scientific presentations at national and international meetings.

Data governance committee has been set up to facilitate data sharing within the institution, through a centrally managed process and access is only provided upon official requests.

Expected Outcomes

- Often confused with outputs (the activities that will be achieved)
- The big impact of the project
 - Relate to public health changes
 - Tool development
 - Policy impact
 - Change in guidelines
- It explains the WHY of the project. Why it is important?

Examples v2

Expected outcomes

The phylogenetic analysis of historical and contemporary CHIKV and DENV sequences will identify new lineages and the spread of lineages across Asia and Africa.

The neutralisation assays will provide a better understanding of the potential protective effect of DENV and CHIKV vaccines given the DENV and CHIKV genetic diversity defined in this project

Expected outcomes

WGS data will be on the ACORN platform and Pathogenwatch for easy data sharing with collaborators and the MoH.

The in-depth phylogenetic analyses will elucidate the links between community carriage and hospital transmission, national and international transmission patterns of MDR strains between Asia and Africa and characterize potential outbreaks.

Deliverables and milestones

- Same thing
- What will your project deliver
- Think of the activities that will be done, how will they be delivered Or what milestones will be achieved

Examples

ACTIVITIES	Deliverable	list of milestones
Drug resistance monitoring		
AmpSeq Illumina platform	Amplicons generated and library prepared products sequenced	Ordered and received MiSeq reagents, run experiments on a MiSeq and data generated
AmpSeq Oxford Nanpore Technologies platform	Amplicons generated and library prepared products sequenced	Ordered and received ONT reagents, run experiments and samples analysed on a MK1B
RT-PCR plasmepsin II & Pfmldr1 for copy number variant (CNV) detection	RT-PCR amplification curves generated, CNV identified	Ordered and received RT-PCR reagents, samples analysed on the RT-PCR machine and data generated
AmpSeq using molecular inversion probes (MIPs)	Amplicons generated and library prepared products sequenced	Ordered and received MiSeq reagents and samples analysed on a MiSeq and MIP data generated

Milestones & Timelines

	2015					
	Mar	Apr	May	Jun	Jul	Aug
Objective 1: Molecular classification of fungal species						
Activity 1: Primer design						
Activity 2: Extraction of DNA from field isolates						
Activity 3: Optimise PCR with control DNA						
Activity 4: Assay DNA from field isolates						
Objective 2						
Activity 5						
Activity 6						
Objective 3						
Activity 7						

Include data analysis and thesis writing

- Suggest start to write the thesis in month 3 alongside your experimental work
- Write out your methods as you go along so that it is complete by the time the experiments are done

Writing techniques, tips for short Bios and CVs

Bullet point format

- Academic credentials
- Employment history
- Work experience highlights (grants won, projects led etc)
- Scientific citizenship (science administrative roles, organized a conference, chaired an institutional meeting)
- Publication list (top 10 and can say why) include ORCID number (ensure it is up-to-date)
- Referee name, email and institutional address

QUESTIONS ???