A Sequential Explanatory Study on the Mental Health of Filipino Youth Living with Human Immunodeficiency Virus (HIV)

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Research studies confirm that individuals with chronic illnesses, such as Human Immunodeficiency Virus (HIV), are at risk for developing multiple mental health conditions. In the Philippines, despite the alarming increase in HIV cases among young people, research investigating their mental health remains limited. Hence, this study was conducted to explore the mental health of Filipino youth living with HIV (YLHIV). A mixed-method approach was utilized, particularly the sequential explanatory research design. In the quantitative phase of the study, 50 Filipino YLHIV participated and 10 among them underwent the phenomenological interview format (qualitative phase). The results found that 72% of the participants had mild to severe depression and 44% reported thoughts of suicide. Further, three themes that characterized their mental health emerged from descriptive phenomenology, i.e., (a) disruptive thoughts, (b) depressive mood, and (c) deteriorative behavior. These findings may serve as a basis for government officials and other advocacy groups in developing mental health programs for YLHIV. Comprehensive and accessible mental health services for this population are highly recommended.

Keywords: mental health, human immunodeficiency virus (HIV), youth living with HIV (YLHIV), suicide, depression.

At the end of 2021, the World Health Organization (WHO) reported that 38.4 million people worldwide were living with Human Immunodeficiency Virus (HIV), which makes the disease a major global public health concern. Of all the HIV cases globally, adolescents and young people represent a growing proportion of affected individuals. In 2020 alone, more than 400,000 young people were newly infected by HIV (UNICEF, 2021).

Young people with a chronic illness like HIV are also at risk of developing mental health conditions such as depression and anxiety disorders compared to the general population. This is supported by a

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quantitative study conducted in the United States showing that 17.5% of youth living with HIV had psychological symptoms of anxiety and depression (Brown et al., 2015), compared with only 2.1% and 6.7%, respectively, in the general population (Center for Behavioral Health Statistics and Quality, 2017). Similarly, a study in Mozambique indicated that adolescents with HIV had higher scores of depression, post-traumatic stress disorder, anxiety, and alcohol and drug abuse, than youth without HIV (Gennaro et al., 2022). In Thailand, Chantaratin et al. (2022) found that about 20% of young people with HIV had significant levels of depression and anxiety. Further, Kamau et al. (2012) indicated that 49% of the YLHIV participants in Kenya reported having at least one clinical diagnosis, such as anxiety disorder or major depressive disorder.

In response to the reported mental health issues of YLHIV, several countries have developed psychosocial programs for this population. Bhana et al. (2020), upon review of 16 studies on YLHIV, observed that the most often used interventions to improve the mental health of YLHIV included family-strengthening approaches, caregiver-adolescent relationships, problem-solving, and communication. In Tanzania, Njau et al. (2022) developed rather comprehensive interventions to address the depression of young people with HIV, including psycho-education, behavioural activation, cognitive restructuring, mood monitoring, and problem solving techniques.

In the Philippines, the Department of Health reported that amidst the COVID-19 pandemic, an estimated 3.6 million Filipinos faced mental health issues such as depression, substance use disorders, and bipolar disorder (University Research Co., 2021). However, despite the growing cases of HIV among Filipino youth, the literature investigating their mental health remains limited. Hence, this sequential explanatory study was conducted.

METHOD

Participants

The present study used a sequential explanatory design which consisted of two distinct phases: quantitative followed by qualitative phase. In the first phase, the researcher collected and analyzed quantitative data from 50 Filipino youth living with HIV. The participants' ages ranged from 18-30 years, with 80% identified as male, 18% married or partnered, and 84% reported living with their families. Then, the collection and analysis of qualitative data from 10 selected YLHIV who participated in the phenomenological interview were conducted in the second phase.

Prior to data gathering, all procedures performed in the present study that involved human participants were approved by the Ethics Review

Committee of the University of Santo Tomas, Manila, Philippines, with Protocol Number (G-2018-PN031).

Measures

The researcher used the following instruments to collect data for this study: *Mental Health Inventory* (MHI-38); *Beck Depression Inventory* (BDI); *Adult Suicidal Ideation Questionnaire*; and *Interview Protocol.* Each instrument is described below:

Mental Health Inventory (MHI-38). MHI-38 is a 38-item self-report tool measuring psychological distress and well-being (Veit & Ware, 1983). The MHI measures six subscales: anxiety, depression, loss of behavioral/ emotional control, general positive affect, emotional ties, and life satisfaction. Sample items of MHI are as follows: "How often did you become nervous or jumpy when faced with excitement or unexpected situations during the past month?" and "How happy, satisfied, or pleased have you been with your personal life during the past month?" As regards the psychometric properties of the MHI, Veit and Ware (1983) tested the instrument with 5089 persons aged 13–69 yrs. The results indicated that MHI had .93 Cronbach alpha, whereas its abbreviated version was found to be .82. To confirm the reliability of the instrument, a confirmatory analysis was conducted by Heubeck & Neill (2000) with adolescents who were literate in the English language and showed an internal consistency of .90.

Beck Depression Inventory (BDI). The BDI is a self-report rating inventory consisting of 21 items designed to measure symptoms of depression, such as mood, guilt, suicidal ideas, loss of appetite, pessimism, and sense of failure, among others. The *Beck Depression Inventory* has acceptable psychometric properties; its internal consistency ranges from .73 to .92 with a mean of .86 (Beck et al., 1988). The instrument has high internal consistency with alpha coefficients of .86 for psychiatric populations and .81 for non-psychiatric populations (Beck et al., 1988).

Adult Suicidal Ideation Questionnaire (ASIQ). The ASIQ consists of 25 items designed to measure the individual's level of suicidal ideation which provides valuable information about the mental health of the individual (Reynolds, 1991). The items of ASIQ are rated on a 7-point scale that measures how frequently the individual thought of committing suicide within the past month. Higher scores in this instrument are indicative of greater suicidal ideation. ASIQ includes items such as "I thought it would be better if I was not alive," and "I thought that if I had a chance, I would kill myself." In terms of the validation and standardization process, the scale was administered to more than 2,000 individuals in college, community, and psychiatric settings. The internal

consistency reliability of the scale was alpha reliability coefficient of .96 (community sample), .96 (college student sample), and .96 (psychiatric sample) (Reynolds, 1991). The scale also has a high test-retest reliability coefficient of .95 (Reynolds, 1999).

These instruments were administered in person at Pinoy Plus Advocacy Pilipinas, Inc., a pioneer support group dedicated to the welfare of people living with HIV in the Philippines. The participants finished the instruments in an average duration of 30-40 minutes.

Interview Protocol

To have a deeper understanding and corroboration of the quantitative data on the participants' mental health, the researcher employed a qualitative approach, specifically the phenomenological research design. This design focuses on describing a particular phenomenon as accurately as possible (Groenewald, 2004). Using said design, the researcher accurately described the lived experiences of YLHIV concerning their mental health. Ten YLHIV recruited from Pinoy Plus Advocacy Pilipinas Inc. participated in the phenomenological interview. Moreover, the researcher developed a semi-structured interview guide to uncover their lived experiences in relation to mental health. Particularly, the interview guide aimed to reveal their experiences with depression, anxiety, suicide, and other mental health issues. Specifically, the questions included items on the emotional, social, and psychological well-being of the participants such as "How do you view your emotional well-being now as HIV+", "Have you ever experienced long-term sadness because of your condition"? If yes, how long was it?

Data Analysis

The data were then analyzed quantitatively and qualitatively. In the quantitative phase of the study, descriptive statistics were employed to analyze the mental health profile of the participants. For the qualitative phase of the study, the researcher used Colaizzi's (1978) seven-step method to analyze the data. The process included: (1) familiarizing with the data by reading the participants accounts; (2) pulling out significant statements from the participants' accounts; (3) formulating meaningful units from the significant statements; (4) categorizing the meaningful units into clusters of themes; (5) developing a full and inclusive description of the phenomenon by incorporating all the themes produced at step 4; (6) condensing the exhaustive description down to a short, dense statement that captures just those aspects deemed to be essential to the structure of the phenomenon; and (7) returning the fundamental structure statement to all participants.

RESULTS

Quantitative Results

Table 1 shows the comprehensive profile of the participants in terms of their mental health.

Table 1

Mental Health Profile of Filipino Youth Living with HIV

Variable	Frequency	%
Mental Health Index		
High	21	42%
Low	29	58%
Psychological Distress		
High	31	62%
Low	19	38%
Psychological Well-being		
High	22	44%
Low	28	56%
BDI (Depression)		
Normal	14	28%
Mild	10	20%
Moderate	12	24%
Severe	14	28%
ASIQ (Suicidal Ideation)		
High	22	44%
Low	28	56%

N=50

Favorable results that indicate greater psychological well-being were outnumbered on every component measure. Forty-two percent (42%) of YLHIV scored as mentally healthy, while 58% scored low–an indication that more than half of the respondents had a negative state of mental health. Further, a specific result was obtained from the two global scales, whereas 62% scored high in psychological distress and only 38% reported low scores. Forty-four percent of the participants reflected positive psychological well-being when more than half (56%) suffered psychological distress. Only 28% of the respondents had normal levels of depression, whereas roughly 72% ranged from mild to severe levels. Lastly, based on the *Adult Suicidal Ideation Questionnaire*, 44% scored high, whereas 56% obtained low scores, which reflects that many of these adolescents have expressed suicidal ideation.

Qualitative Results

Through careful analysis vis-à-vis transcendental and eidetic reduction of the narratives of select youth living with HIV, this study

afforded the emergence of three themes namely: (a) disruptive thoughts, (b) depressive mood, and (c) deteriorative behavior.

Disruptive Thoughts Accommodating the fact that HIV infected them was very disturbing for the participants. They were besieged by several irrational thoughts, such as overestimation of danger and illogical interpretation of their diagnosis. Particularly, they were terrified by the thoughts of dying at a young age and were worried about their future. As verbalized by the participants:

> That time, I kept on thinking that I was dying, that there is no treatment for HIV. I was worried for my family because I am the breadwinner" (Participant 2).

> I thought I was dying. I was thinking what will happen to the dreams I have for my family. Moreover, I was bothered on how to tell my parents about my health condition (Participant 10).

Besides entertaining irrational thoughts, the participants were likewise disturbed by anxious thoughts as manifested by their fear of being rejected and discriminated against by family, friends, and romantic partner and in the workplace. As expressed by the participants:

> How can I work if I have this illness? They might trace it through medical examination (Participant 1).

> I am afraid to form a romantic relationship because I might transmit the virus. I don't want my partner to get sick because of me (Participant 3).

Cognizant of their present health condition, the participants were also bombarded with suicidal thoughts as evidenced by their death wish, thinking of killing themselves, and thoughts that other people are better off without them.

> I thought that instead of dying from the opportunistic infections of this virus, I wish I would not wake up the next day (Participant 1).

The irrational and anxious thoughts of the participants were entrenched from certain triggers in their environment, particularly the lack of available information about HIV. They articulated that they had limited information about the illness and the information they did have was mostly misconceptions about its transmission, treatment, and prevention. This wrong notion triggered the fear of being rejected and discriminated against in the workplace.

This finding supports the claim of Cournos et al. (2005) and Dorrell et al. (2008) that after learning about their HIV status, most PLHIV had personal concerns like the fear of death and uncertainties about the future. Additionally, the anxious thoughts of the participants were expressed by their fear of rejection and discrimination. The findings converged with the study of Jena (2014) in one wellness clinic in South Africa, indicating that adolescents living with HIV showed anxiety. These anxious thoughts were fueled by a lack of accurate information about their health condition. Moreover, youth living with HIV were bothered with suicidal thoughts and death wishes. According to Badiee et al. (2011), suicidal thought is common among people with HIV as compared to the general population. Alarmingly, suicide rates have been reported at elevated levels in this population (Carrico, 2010). This suicidal tendency is triggered by the burden that accompanies the long-lasting implication of being HIV positive (Kalichman et al., 2000). Further, stigma, discrimination, low self-esteem, and lack of social support are other factors directly associated with suicidal thoughts and behaviors of people living with HIV (Casale et al., 2019; Wang et al., 2018).

Depressive Mood Learning that they were infected by HIV was not easy for the participants. They were blasted with the emotional turmoil that intruded on their daily activities at home, in school, and even in the workplace. Notably, the participants articulated their experience of emotional distress on the first few months of living with the illness. They were in a deep state of agony and disbelief. As verbalized by the participants:

> I felt like I was going crazy that time. Some of my friends told me not to stress myself, but it stressed me a lot. From time to time, it sank in. I really didn't know what to do (Participant 1).

> It felt like I was blown up when they told me about the result. I even tried to ask for a second opinion because I couldn't believe it. Gosh, I was extremely terrified at that time. 'I'm certain my parents will kill me,' I uttered (Participant 2).

The other participants experienced persistent feelings of sadness. They verbalized feelings of aloneness and loneliness especially the undisclosed YLHIV. Generally, they felt miserable because of their health condition. The following are some of the verbalizations of the participants:

> After knowing the HIV test result, I kept it for a long time. When I was with my parent, I pretended to be OK, but in reality, I felt so sad most of the time" (Participant 7).
> "I felt lonely; I had difficulty coping with loneliness. I couldn't do the things that I previously enjoyed; I lost interest in almost everything" (Participant 6).

Likewise, the participants conveyed their experience of hopelessness as they struggled with HIV. They were uncertain about their future and expressed pessimism about life in general.

> I have a lot of dreams in life, dreams for my family, but all these dreams are shattered because of my illness. I felt so hopeless (Participant 4).

The indices of depressive mood were prompted by discrimination. One participant shared that he experienced discrimination from his own family. He said:

> After telling my parents about my condition, I noticed that they avoided using the utensils we used to share like drinking glass, spoon, and fork. I even shared a room with my brother before, but now, they asked him to move out of my room (Participant 1).

Another factor that incited the depressive mood of the participants was non-disclosure. They reported having difficulty disclosing their health condition due to the stigma associated with the illness.

This finding concurs with the report of UNAIDS (2018) that people with HIV have a higher risk of developing mental health conditions like depressive symptoms. The said report supports the claim that medical conditions like HIV could serve as a major source of stress that negatively affects a person's mental health (US Department of Health and Human Services, 2020). In South Africa, young people with HIV reported mental health difficulties of depression and stigma (Toska et al., 2019). In a cross-sectional study conducted in Jamaica, youth with HIV ages 15- 25 years were found to have high rates of stress (64%) and depression (63%) (Brown & Morgan, 2013). The depressive symptoms of YLHIV are triggered by factors such as discrimination, non-disclosure, and lack of social support. This particular result is aligned with the findings that living alone and having poor social support were significantly associated with depression (Amare et al., 2017; Bhatia & Munjal, 2014).

Deteriorative Behavior The participants also struggled with behavior that impaired their physical and social well-being. After knowing their HIV status, they started engaging in several deteriorative behaviors like losing

interest. Particularly, the participants started to lose interest in their work, refused to go school, and disengaged themselves with activities they previously enjoyed. As uttered by the participants:

> I came to the point that in almost two months, I did not go to work. I lost my willingness to work" (Participant 5).

> Before, I loved going to the gym. I usually spent an hour or two twice or three times a week. But now, I don't go to the gym anymore (Participant 6).

Moreover, the participants experienced self-neglect while living with a chronic illness. They disregarded the regular intake of food and ate on an irregular schedule.

> What happened to me was I skipped some meals in a day. There was even a time that I ate only once each day. I had difficulty getting up to do the usual (Participant 9).

Some participants even engrossed themselves in dangerous vices like substance use as a form of avoidant coping mechanism.

> The time that I learned about my HIV status, I started smoking cigarettes, drinking alcoholic beverages, and even tried taking marijuana. I felt so devastated. That's why I didn't care about my health anymore (Participant 1).

For people living with HIV, participating in the usual social interactions was challenging. The participants reported that they experienced withdrawal from other people, such as their friends and workmates.

> Actually, I started to avoid mingling with my friends. I was afraid that every time I was with them, they might discover my health condition (Participant 10).

Loss of interest and self-neglect were triggered by internalized stigma, specifically the thought of dying at a young age. This negative notion about the illness fueled their unwillingness to perform their usual tasks. Meanwhile, engaging in dangerous vices was entrenched in denial of HIV status. They refused to accept their diagnosis; hence, they engaged in avoidant coping mechanisms. Further, the participants' experiences of discrimination from family and friends provoked social withdrawal. They detached themselves from social activities because they were repudiated by their own family.

YLHIV displayed behaviors that harm their physical health, such as smoking cigarettes, drinking alcohol, and using marijuana (Brown & Morgan, 2018). These behaviors are coping mechanisms of YLHIV in dealing with psychological distress brought about by their illness (Duko et al., 2019). This suggests a significant link between psychological distress and substance use among young people infected by HIV. In terms of social withdrawal, the British HIV Association and British Association for Sexual Health (2018) reported that social isolation is one of the top lists of unmet social needs among YLHIV in the United Kingdom. They withdraw from other people out of fear of being stigmatized and discriminated (Dejman et al., 2015; Wallack & Brotman, 2012).

DISCUSSION

The quantitative findings imply that YLHIV struggle with mental health conditions such as anxiety, depression, and loss of behavioral/emotional control. This supports the survey conducted by Youth Stop Aids (n.d.) in America, wherein 85% of young people reported their mental health is worse and poorer than non-HIV peers. As stated by Dow et al. (2020), YLHIV with unaddressed/unattended mental health problems are indeed increasing. The Youth group alone had a high prevalence of mental health issues (Newman et al., 2021), but those who live with HIV are frequently diagnosed with mental health disorders (Pokhrel, 2019). Further, they often experience problems in emotional, psychological, and behavioral aspects at higher rates than the general population (Mellins & Malee, 2013). Moreover, this quantitative finding is also aligned with the themes that emerged from the qualitative phase of the present study. The participants reported that they experienced anxiety as manifested by their irrational fears, worries, and intrusive thoughts caused by the misconceptions they held about HIV.

BDI results showed that 52% of the respondents reported mild to severe levels of depression, which is higher than the general population. This is supported by the study of Brown et al. (2015), showing that 17.5% of youth living with HIV had psychological symptoms of depression compared with only 6.7% in the general population (Center for Behavioral Health Statistics and Quality, 2017). That is similar to the findings of Girma et al. (2021) which showed a 30.2% prevalence of depression in Ethiopia, and that of Fawzi et al. (2016) which revealed a 26% prevalence in Rwanda. Additionally, Benton (2019) found that depression simultaneously existed with HIV among the population of youth, which then, as a result, worsened the negative state of their mental health. Further, depression is one of the themes that emerged from the phenomenological interviews conducted in the present study. As reported

by the participants, they experienced long-term sadness, feelings of guilt, and hopelessness.

Based on the *Adult Suicidal Ideation Questionnaire* result, 44% scored high, while 56% obtained low results. Though low scorers are more than half, 44% is still a large portion of the sample, which reflects that many of them were suicidal or have been thinking of ending their lives. As stated by Tsegay & Ayano (2020), people with HIV have a high prevalence of suicidal attempts and ideation, and the worst is, it was linked with high risk of complete suicide. Suicide is a serious cause of death globally, but YLHIV's rate of suicidality proved to be higher than the general population (Wonde et al., 2018). They also found a magnitude of 27.1% HIV patients who have suicidal ideation, and 16.9% had attempted self-annihilation. A systematic review further unveiled that 26.9% of HIV patients have reported suicidal ideation, 22.2% had planned the deed, 20% harmed themselves, 23.1% has been thinking to end their lives, 14% desired death (Catalan et al., 2011), and 24.38% had suicidal ideation in their lifetime (Tsegay & Ayano, 2020). Consistently, qualitative data from the current study indicated that the participants experienced suicidal ideation in the form of death wish, thinking of harming or killing one's self, and thinking that others would be better off without them.

Globally, studies consistently indicate that mental health of YLHIV is poor. They have a high prevalence of depression and are suicidal. The percentage from the present study shows it is even higher in the Philippines. Such a result reveals that their population is at high risk of having mental health issues, and this may be a manifestation of a systemic problem. Stigma from society and the self, social rejections, prejudice, and disinformation worsens their situation. In the Philippines, Alibudbud (2022) reiterated that gender-based discrimination, lack of sex education and communication negatively affect their mental health. With this, HIV infection turns out to be a problem that does not only start and end on the person alone and the infection attained from several mediums. Poor mental health also reflects their unhealthy environment and negative roles played/contributed by the social system.

The present study only focused on describing the mental health status of YLHIV using a mixed-research approach. The result does not establish the causal relationship of HIV diagnosis and mental health. Other limitations of the study include small sample size and the reliance of self-report for measurement. Hence, it is suggested that additional research should be conducted to better assess the mental health of youth living with HIV.

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Scalable Query Profiling Employing Purging and Elimination Technique

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ABSTRACT

Reusing Queries contributes in speeding up the performance of database in responding to future queries as it can reduce the number of database queries to be processed and sent back to the user. Profiling a query in a machine who requested a query in database server improved the response time when the query is reused. It also avoids the utilization of database and network resources. This is because the data will be served locally as compared to obtaining the data from the original source that is still travelling in the network which entails cost not only on the database server but also in the network infrastructure. A condition in the query that limits the result set of the query will be removed before it will be sent to the database for evaluation. This is to enhance the ability and usefulness of the result set of the query in answering future subdued queries to be requested. To prevent query capability duplication as well as to efficiently manage the space utilizes in the profiling of queries, profiled queries that are subdued by an incoming query will be purged while queries that are subdued to profiled query will not be accepted in the query logs and its result set will not be exported.

CCS Concepts

Profiling Query → Query logs • Purging query → avoids query capability duplication • Elimination → enhanced **the ability of the result set of query in answering future subdued query to be executed.** The dependency of the client to the database server in terms of responding to queries will be decreased as the number of query in the query logs increases. The shifting of some of the workloads of the database server to the client prevents the constant utilization of infrastructure such as the database server and network resources by properly utilizing the previously requested information. It can also decrease the response time for requested queries that are subdued to previously executed query.

Keywords

Queries, Database, Subdued Queries, Reusing Result Set, Purging, Query Identification Number, Index;

1. INTRODUCTION

Reusing Queries contributes in speeding up the performance of database in responding to future queries as it can reduce the number of database queries to be processed and sent back to the user. Moreover it can also decrease the utilization of database resources as well as the infrastructure cost according to West [1]. Information in databases is typically accessed using SQL query. The select statement is the responsible statements in order obtain results from a database. A typical request of information in the database performs some steps before a user may able to view the requested information. 1. The user formulates query using the application software. 2. The application software connects to the database and submits the query. 3. The database retrieves data and returns these to the user. 4. The application software receives the incoming data and presents them to the user. These four steps will be repeated from time to time for every query that will be made. This entails cost because the resources of the database will be frequently utilized. If it will be applies in a server-client setup, the bulk of the workloads will lies on the database server as well as the regular utilization of infrastructure is needed for the processing of every requested query. The text of the query and its result set will be profiled in the client side and it will be used to respond to future subdued query to be executed.

2. OBJECTIVES

The objective of the study is to develop a model that will enhance the capability of SQL Queries by employing purging and elimination technique. Specifically it aims to;

1. Eliminate condition in the query before sending to the database for evaluation.
2. Profile a query.
3. Purge queries that are subdued by incoming query.
4. Reuse past query in responding to requested query.

3. METHODOLOGY

3.1 Elimination

The purpose on the presence of a condition in the query is designed to extract only those information from the database that meets the criteria. This scenario will limits the number of rows to be produced, thereby it also limits is ability to respond to future subdued queries to be executed because its result set when reused is only capable to answer subdued queries that are joined with similar condition. In order to avoid this, the requested query will undergo checking process to identify the existence of a condition. If a condition is detected, next step is removing it from the query before it will be sent to the database for evaluation. Conditions in the query will be distinguished by the existence of a "where" keyword in the query.

3.2 Query Profiling

Query Profiling will be applied after the query undergone elimination process. A folder that serves as the repository of unique requested query will be created to store the text of the query and its result set. A file will be created and it will contain the text of requested queries which referred to as the query logs [2]. The result set of the query will be exported as text file [3] and it will be stored in a row and column format. The uniqueness of the query is determined by its source where the information will come from and the included field. Before the text of the query will be registered in the query logs, it will be attached with QUERY INDENTIFICATION NUMBER, which is an auto number generated by the algorithm [4]. The generation of QIN number will start to one (1) and progresses

the result set of the query; 3. Established relationship between the text of the query and its result set and 4. Key to pinpoint who among the profiled queries are capable to respond to the requested query. The query logs will used purposely to respond to queries that are subdued from the past queries. Requested Queries that are unable to be responded by profiled queries will be directed to source-out its data to the database and it will be deposited in the repository.

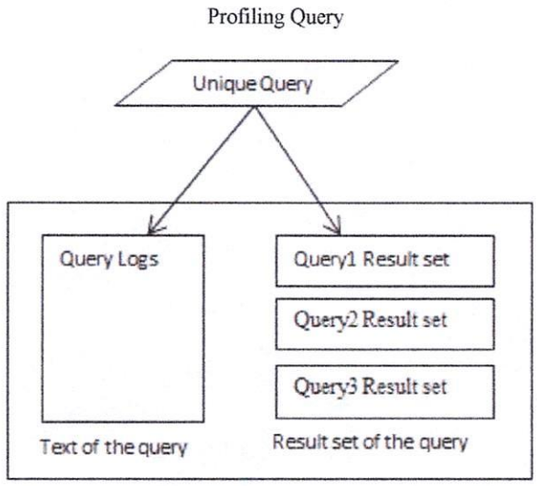

Figure 1. The text of the select statement will be stored in the query logs while its result set will be exported in the same repository.

3.3 Purging

As a way of maintaining the repository as well as to efficiently manage the space it utilizes, purging technique will be employed. The text of the profiled queries in the query logs will be compared to the text of the incoming query. If the text of the profiled queries stored in query logs matched or subdued by the text of the incoming query then the text of the profiled query in the query logs will be purged from the list along its result set [5]. Text of profiled queries are considered to be subdued if it meets the criteria; 1. It's source of data is similar to the source of the incoming query and 2. Its field/s are all existed in the incoming query. This technique was implemented in order to avoid query capability duplication because the incoming query contains or has the capability to respond to future queries that can also be served by queries that are already profiled. This method will not only reduce the number of queries stored in the repository but also to free some used space [6].

3.4 Method of Reusing Query

The text of the requested query will be compared to the text of profiled queries in the query logs in order to determine who among the profiled queries are responsive to the requirement of the requested query. A profiled query in the query logs will become responsive to the requirements of the requested query if they have similar source and the field/s in the text of the requested query are all existing in the text of the profiled query. After determination, the QIN attached to the text of the profiled query will be used to pinpoint its result set followed by extraction and population for the purpose of reuse [7]. An index/es will be generated for the text of requested query by way of matching it to the fields of the text of subdued profiled query which eventually served as referenced field in the populated result set in the format of rows and column followed by iteration until the last data will be obtained.

Assume that this query requested;

and let assume that the query below is stored in the query logs,

Select
user_id,username,first_name,last_name,gender,password,status **from** user details

The index/es would be;

2 3 4 6

Reusing the query logs and its result set

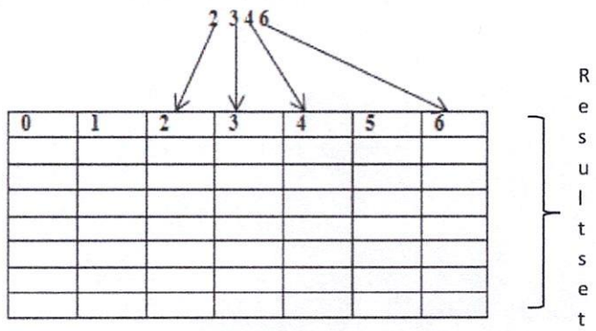

Figure 2. Utilization of the generated indexes of the query as bases in referencing to the populated result set of the query logs.

4 PERFORMANCE TEST

4.1 Testing

The model was tested on a server-client setup. In the server side, MySQL were used to create the database and the table and uploaded a dataset containing ten thousand (10,000) rows with seven (7) fields [8] [9]. The sample dataset was downloaded at https://www.sample-videos.com/download-sample-sql.php. The uploading process was done by utilizing the interface of phymyadmin. Seven (7) different queries were formulated and executed using the designed model installed in the client side. The queries are shown below.

1. Select user_id from user_details
2. Select user_id,username from user_details
3. Select user_id,username,firt_name from user_details
4. Select user_id,username,first_name,last_name from user_details
5. Select user_id,username,first_name,last_name,gender from user_details
6. Select user_id,username,first_name,last_name,gender,password from user_details
7. Select user_id,username,first_name,last_name,gender,password,status from user_details

Every query was executed twice because in the first execution, the model obtains its data from the database server and profiled it in the client side. In the second execution, the query is responded by utilizing the repository because it is now subdued to the previous query which means the query will be served locally [10]. Instead of obtaining the data to the database server, the request will be serve locally. This method avoided the utilization of the database server and network resources because the data will not be obtained from the original source. Two scenarios were used in executing the formulated queries which is the ascending and descending order. In ascending order of execution, there was a chance that the query will be

query will be purged because it is subdued by the incoming query. After executing the seven queries, the last query which is the **"Select user_id,username,first_name,last_name,gender,password,status from user_details"** retained in the repository. In descending order of execution of the queries, the last query which is the **"Select user_id,username,first_name,last_name,gender,password,status from user_details"** was executed first. The next six (6) queries were not admitted to the repository because they are all subdued to the first query.

Table 1. Latency incurred in the execution of the query.

Queries	Latency for the First Execution (in seconds)	Latency in Second Execution (in seconds)
Select user_id from user_details	0.26764297485 4	0.077657938 0035
Select user_id,username from user_details	0.31285214424 1	0.123073101 044
Select user_id,username,first_name from user_details	0.36400580406 2	0.156177997 589
Select user_id,username,first_name ,last_name from user_details	0.35187792778	0.175606012 344
Select user_id,username,first_name ,last_name,gender from user_details	0.31780791282 7	0.204800844 193
Select user_id,username,first_name ,last_name,gender,password from user_details	0.63918900489 8	0.251147985 458
Select user_id,username,first_name ,last_name,gender,password, status from user_details	0.43551301956 2	0.264527797 699

The result shows that the latency in the second execution was decreased by fifty (50) percent as compared to the first execution across to all the executed query. One of the contributory factors for this reason is that in the second execution, the data were not travelled in the network instead the query was served locally.

4.2 Simulator

The performance of the query was simulated using the JMeter. [11] [12] It will be the source of response time graph. The response time is the elapsed time from the moment the query is sent to the server until the moment when the last bit of information has returned to the client [13]. Ten (10) users with ten (10) loops counts at one (1) transaction per seconds were set as the parameters for the testing of the query that accessed data from the database server with 10000 rows. It is decided that only the last query will undergo simulation because it is the query that retained in the query logs.

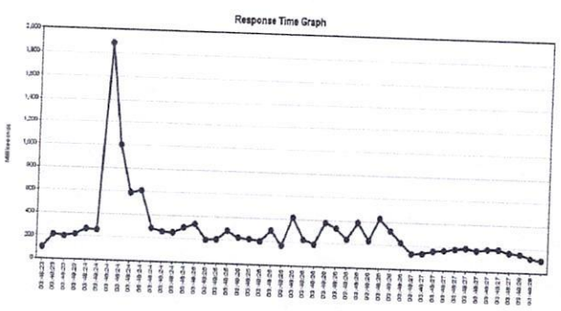

Figure 3. Response time graph when the query Select user_id,username,first_name,last_name,gender,password

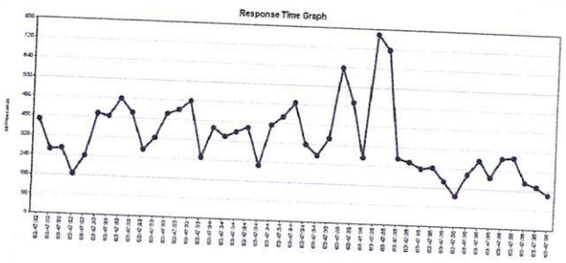

Figure 4. Response time graph when the query Select user_id,username,first_name,last_name,gender,password, status from user_details was executed for the second time.

The response time graph indicates that the figure 1 incurred higher latency as compared to figure 2. The highest response time per request in figure 1 is registered at almost 2000 milliseconds while in the figure 2 is almost 800 milliseconds.

5. CONCLUSION

In a scenario where the same information are to be accessed by a substantial number of users, a single access can be possibly cater the needs of the entire users which substantially reduced the amount of request being sent to the database which lead to decreased utilization of infrastructure.

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