The Efficacy of Short-Term Career and Technical Education Programs in the Western New York Area

John C. Geh
St. John Fisher College, gehjc001@live.com

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The Efficacy of Short-Term Career and Technical Education Programs in the Western New York Area

Abstract
Career and Technical Education (CTE) programs provide people with an opportunity to upgrade and develop skills in a fast-paced, rigorous, academic, and technical educational environment as opposed to traditional, post-secondary programs, which often take 2 years or more to complete. Sub-baccalaureate, short-term certificate training programs are accelerated programs designed to efficiently and quickly return individuals to the workforce. Nationwide, the dramatic increase in short-term educational certificates suggests careful consideration when distinguishing between certificate values based on program completion lengths, before- and after-employment incomes, and workforce development in the Western New York area. The purpose of this quantitative study was to explore the relationship between the before and after employment incomes of Western New York post-secondary graduates from noncredit-bearing, short-term CTE programs. The length of the programs and several demographic characteristics of the participants were also examined in relation to their income levels. The population consisted of a racially diverse group of students (N=490) who self-reported verifiable employment income after completing CTE short-term programs. This study revealed a statistically significant positive association between post-graduation employment incomes and pre-enrollment employment and length of the program. Results also indicated a statistically significant positive association between post-graduation employment incomes with age and gender.

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The Efficacy of Short-Term Career and Technical Education Programs in the Western New York Area

By

John C. Geh

Submitted in partial fulfillment of the requirements for the degree Ed.D. in Executive Leadership

Supervised by
Dr. Shannon Cleverley-Thompson

Committee Member
Dr. Bernard Ricca

Ralph C. Wilson, Jr. School of Education
St. John Fisher College

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Biographical Sketch

John C. Geh is currently a financial administrator with the College of Brockport at the Rochester Educational Opportunity Center. John C. Geh attended Fort Valley State College from 1989 to 1991 and graduated with a Bachelor of Sciences degree in Agricultural Economics. He attended Alabama A&M University from 1991 to 1994 and graduated with a Master of Sciences degree in Agricultural Business Management. He came to St. John Fisher College in the summer of 2013 and began doctoral studies in the Ed.D. Program in Executive Leadership. John Geh pursued his research in The Efficacy of Short-Term Career and Technical Education Programs in the Western New York Area under the direction of Dr. Shannon Cleverley-Thompson and Dr. Bernard Ricca and received the Ed.D. degree in 2016.
Abstract

Career and Technical Education (CTE) programs provide people with an opportunity to upgrade and develop skills in a fast-paced, rigorous, academic, and technical educational environment as opposed to traditional, post-secondary programs, which often take 2 years or more to complete. Sub-baccalaureate, short-term certificate training programs are accelerated programs designed to efficiently and quickly return individuals to the workforce. Nationwide, the dramatic increase in short-term educational certificates suggests careful consideration when distinguishing between certificate values based on program completion lengths, before- and after-employment incomes, and workforce development in the Western New York area.

The purpose of this quantitative study was to explore the relationship between the before and after employment incomes of Western New York post-secondary graduates from noncredit-bearing, short-term CTE programs. The length of the programs and several demographic characteristics of the participants were also examined in relation to their income levels. The population consisted of a racially diverse group of students (N=490) who self-reported verifiable employment income after completing CTE short-term programs. This study revealed a statistically significant positive association between post-graduation employment incomes and pre-enrollment employment and length of the program. Results also indicated a statistically significant positive association between post-graduation employment incomes with age and gender.
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Chapter 1: Introduction

Background to the Study

Most industrialized nations have formal vocational institutions, including apprenticeships, that transition youths from public education to the workplace. In the United States, Career and Technical Education (CTE) is the preferred model for workforce development and/or vocational training (Stone III, 2013). States act as the primary governing bodies to administer federal funds in support of CTE programs (Stone III, 2013). The traditional outcome from these programs are industry-recognized credentials that validate job skills in a particular profession. One out of four adults in the United States, at some point in their life, has obtained a professional credential, a certification, license, or an educational certificate that does not include post-secondary degree awarded by a college and a university (Ewert & Kominski, 2014).

One way New York State (NYS) supports CTE programs is by the use of “post-secondary education, such as that offered through the State University of New York (SUNY) system. The SUNY system serves as an important gateway to developing and expanding human capital within the state” (Vogel & Keen, 2010, p. 384). An example of such a gateway institution is the University Center for Academic and Workforce Development (UCAWD), which has a mission to promote the social and economic well-being of the academically and economically under-served residents of the State of New York. The UCAWD undertakes this state mandate by developing and maintaining quality educational, workforce training programs, and services through a state network.
Legislative history. The federal government has funded CTE since 1917, when Congress initiated its appropriation with the passage of PL 65-347, also known as the Smith-Hughes Act. This act established support to secondary and post-secondary vocational or technical training institutions for the first time. Vocational education was seen as vital to national defense and prosperity (Dortch, 2014). Several amendments were added through the years leading up to another significant workforce-training act known as the Manpower Development and Training Act (MDTA) of 1962, P.L. 87-415, which was intended to help in the preparation of individuals for employment especially those who were assumed as reasonably unable to secure full-time employment without training. The MDTA was designed, in part, to address high unemployment by retraining individuals with obsolete skills to suit the rapidly advancing technology (Dortch, 2014).

Another landmark legislation was in 1963 with the passage of P.L. 88-210, also known as The Vocational Education Act. This act opened vocational or technical instruction to everyone, including those with disabilities, and it also supported vocational work-study programs, research, training, and demonstration (Dortch, 2014). President George W. Bush signed the most recent major legislation into law in 2006, P.L. 109-270, also known as The Carl D. Perkins Career and Technical Education Act, which emphasizes increased standards for technical students and also introduces academic curriculum in technical programs (Friedel, 2011).

This brief history of CTE serves as an account of the legislative journey, and it also serves as a context for how U.S. government policy is connected to CTE. It must be noted that between these landmark legislations, there were several amendments that culminated in shaping CTE as it is today (Friedel, 2011). In recent years, CTE and
workforce development have been inextricably bound. CTE is an important element of the nation’s workforce development system that plays a role in reducing unemployment (Dortch, 2014). President Barack Obama mentioned career pathways in his State of the Union address while highlighting the need to advance workforce development through assistance to community colleges (Obama, 2010). In the 2013 fiscal year budget, the Obama administration funded a new initiative designed to increase access to job training across the country (U.S. Department of Education [USDOE], 2012).

President Barack Obama also proposed and provided $8 billion to the Department of Education and Labor to support state and community college partnerships with businesses to build the skills of American workers (Lauerman, 2012). These policies recognize the need for collaboration between employers and post-secondary institutions. The caution here is that “employers would prefer not to pay for general training like training in skills that are not specific to one firm because it is less costly for them to hire skilled workers who have been trained elsewhere” (Lazaryan, Neelakantan, & Price, 2014, p. 2). This claim supports the role of government assistance in supporting educational training. A case in point is NYS Governor Andrew Cuomo’s proposal to establish tax-free zones for employers willing to relocate and work with SUNY campuses across the state (NYC Press Office, 2013). In his State of the Union speech, President Obama said that most jobs in our economy would require credentials above a high school diploma (Obama, 2010). This goes to highlight the point that, amongst other programs, CTE programs show promise in contributing positively to the nation’s labor force.

**Policy implication.** Public policy plays a significant role in CTE because its funding comes from the federal government. The Government Accountability Office
(GAO) reported 34 federal programs in 2009 providing occupational or vocational training as a primary service through national systems like CTE administered by the USDOE (Dortch, 2014). This directly speaks to the importance that the federal government places on Career and Technical Education programs. Congress has highlighted the need to support workforce development more effectively in an effort to reduce unemployment during the Great Recession of 2008-2009 (Dortch, 2014).

Market failure generally refers to a situation in which the market, on its own, fails to allocate resources efficiently (Bator, 1958; Cowen, 2008; Lee & Clark, 2013). One reason for labor market failures may include the fact that the supply of market skills does not match the needs demanded by employers thus causing a false shortage in the labor market. Such an imbalance may be manifested as an oversupply or undersupply of skills where the demand for skills is out of sync in either direction (Cappelli, 2015). One practical example that may cause labor market failures occur when employers are reluctant to invest in transferable skills for fear there might be limited checks to reap the returns fully from these investments. The fear comes from the fact that competing firms may be able to lure employees away for higher salaries once they have been trained—especially as the competing firms did not initially invest in the employees’ trainings (Lazaryan et al., 2014). On the other hand, individuals may also be reluctant to invest substantially in industry-specific skills if there is a chance of job loss in the fields that require those skills. This situation can result in market failure, making government intervention necessary to create an appropriate balance (Estevez-Abe, Iversen, & Soskice, 2001).
There is a reason for government expenditure on employment training programs like CTE. When measured in terms of the value of the original investment spent on government training programs, such as CTE, the returns on this investment give greater rewards for the expenditures than other government-transferred earnings such as other safety net or welfare programs. This is especially true because, as individuals become employed, their tax contributions resulting from employment increases government revenue and individual welfare, which otherwise would not have been realized (Eisenstein, 2009; Kotamraju & Mettille, 2012). In other words, every dollar spent or invested on CTE programs by the government has the potential to result in revenue for the federal and state government that is greater than the original dollar spent (Eisenstein, 2009; Kotamraju & Mettille, 2012).

**Academic and technical education.** CTE is a broad term with varying perspectives ranging from workforce education to technical education to secondary and post-secondary career educational programs (Rojewski, Asunda, & Kim, 2008). However, the United States Congress defines CTE as organized educational activities that offer a sequence of courses that, “provides individuals with coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in current or emerging professions” P.L. 109-270, Sec. 3 (U.S. Congress P.L. 109-270, 2006). In this regard, CTE prepares students for roles outside the paid labor market, such as soft skills. It also teaches general employment skills, as well as the skills required for specific occupations or careers (Dortch, 2014).
Federal legislation has moved CTE from a segregated part of the secondary and post-secondary school curriculum to an integrated element that jointly improves both academic and career readiness (Bozick & Dalton, 2013). The academic component of CTE provides general courses that help to develop and build soft skills for customer relationships, as well as reading, writing, and math skills. On the other hand, the technical component of CTE provides with the specialized skills needed for a specific job or trade. Scholars in the CTE area have yet to determine conclusively if this integration has an enhanced effect on both academic and CTE students (Blowe & Price, 2012; Fletcher Jr., 2012).

CTE creates career pathways for young adults that lead to credentialing and, ultimately, employment. Furthermore, the flexibility offered by CTE programs helps students attain educational potential and/or professional goals. Today, CTE is one academic pathway that is continuing to emerge as an approach to facilitate students’ transition from high school to post-secondary education (Dare, 2006). CTE, which was once considered a track for not-college-bound high school students, has evolved through the years to include rigorous academic preparation with integrated CTE programs (Dare, 2006). This dual-tract adjustment has attempted to increase college-preparatory coursework as well as provide pathways for post-secondary education participation (Fletcher Jr., 2012b).

This research study is concerned with CTE short-term certificate programs that prepare students for the workplace. This view is consistent with that of Rosenbaum, Cepa, & Rosenbaum (2013) who postulated that attending secondary or post-secondary institutions have little influence on students’ earnings unless they obtain a credential for
employment and economic security. In this regard, Rosenbaum et al. (2013) agreed with the general academic component of education, they on the other hand, highlighted skills acquisition as the most important aspect of acquiring an education. This study therefore focuses on the value of obtaining short-term certificate in post-secondary institutions in the Western New York area.

**Problem Statement**

An argument for CTE is that there is a skill gap in the economy for workers (Abraham, 2015; Kahn, 2015). The lack of employee skills means that employers cannot get the best workers for the emerging jobs in the new information- and/or technology-driven economy (Cappelli, 2015). Speaking to this point, the Center for Law and Social Policy and the National Center for Higher Education Management (CLASP-NCHEMS) Returns on Investment (ROI) Dashboard Tool results show that, for the U.S. or each state to remain globally competitive, 60% of adults between ages 25 to 64 should have an associate or bachelor’s degree by 2025. To put this into perspective, in New York State, the current degree completion rate is 44.1%. To meet the 60% goal, New York needs to produce 424,036 degrees annually above the current trend. (Center for Law and Social Policy [CLASP], 2012). This means that for the labor supply to catch up with the labor market demands, credentials that upgrade high school diplomas will be needed. Given the high unemployment rates during the recent Great Recession of 2008-2009, it seems realistic to believe that jobs are unavailable. Elsby, Hobijn, Şahin, and Valletta (2011) suggested that skills mismatch likely contributed up to one percentage point increase in the unemployment rate, referring to imbalances between vacancies and unemployment shares across sectors and occupations as the cause (Association for Career and Technical
Education [ACTE], 2010; Elsby et al., 2011). Commenting on the same view, Fletcher Jr. (2012) suggested that, “policymakers have begun to shift their concern from solely concentrating on the preparation of students for college to preparing them for the workforce as well. Thus, it is time for CTE to understand its impact on students’ long-term trajectories” (Fletcher Jr., 2012, p. 103).

According to Mupinga and Livesay (2004), most CTE post-secondary schools offer programs in three broad category areas, which include services, health and life sciences, business and marketing. These areas have seen some of the fastest growing, in-demand and high-paying jobs in the past 20 years (Mupinga & Livesay, 2004). Some recent studies show that, even during uncertain economic times, there are several opportunities for students to gain well-paying, challenging, and rewarding jobs—many of which do not require extended post-secondary education (Hutchins & Morrison, 2012).

The fundamental purpose of pursuing an education is to obtain the right credentials for a job, but some students earn post-secondary school credits and never get a job that provides a livable wage (Rosenbaum, 2001). Stackable credentials are incremental in nature where programs teach at each level to proficiency in a particular skill and competency to facilitate incremental advancement in competencies that identify credentials of higher levels of skill achievement (Albrecht, 2011). One of the U.S. Department of Labor’s (USDOL) suggestions to the problem of some students earning post-secondary school credits and never getting a job that provides a livable wage is to develop industry-recognized stackable credentials with a clearly defined set of skills and competencies that are linked to employment opportunities and advancement (ACTE, 2011). The USDOL defines stackable credentials as part of a sequence of credentials that
can be accumulated over time to build up an individuals’ portfolio of qualifications and help them to move along a career pathway to better and potentially higher-paying jobs (Albrecht, 2011; Reese, 2011).

Most short-term CTE programs are terminal at each competency stage, while others can be used as a stepping-stone to obtain a more advanced credential (Dortch, 2014). For example, in the nursing area, students who are admitted to take courses leading to a certified nursing assistant certificate (CNA) can continue with an Associate Degree in Nursing or Licensed Practical Nurse (LPN). The advantage here is that students can secure a job, take care of their families, and continue schooling for a higher paying position, such as an LPN. CTE programs offer a sequence of courses to young adults with coherent and rigorous content that aligns with challenging academic standards and relevant technical knowledge for credential attainment (USC, 2006). One of the important outcomes for CTE program students is a certificate. However, for certificates to be sufficient, there must be industry-wide acceptance for such credentialing so that employers will be comfortable with the graduates’ skills and competencies. While CTE programs work toward meeting credential attainment purposes to promote workers’ entry into the workforce, they also have to be flexible enough to allow students to continue with higher education (Reese, 2011). It is essential to note that these credential attainments, including significant job-related licenses and/or industry-recognized certifications, are key outcomes for CTE programs (Rosenbaum et al., 2013).

**Theoretical Rationale**

This study explores the relationships between employment incomes and incomes prior to enrollment for post-secondary CTE graduates from short-term, 1 year or less
CTE programs in the Western New York area. Completion of these short-term programs enable CTE graduates to earn certificates, which are a recognition of the completion of a course of study based on a specific field associated with a limited set of occupational skills (Carnevale, Rose, & Hanson, 2012). Post-secondary occupational institutions that confer accredited degrees and certificates in occupational fields prepare students in many mid-skilled level jobs in a variety of fields, such as health sciences, consumer services, business, protective services, and several other professional areas (Rosenbaum & Rosenbaum, 2013). Credentials and certificates are the end product of these institutions, which signals higher productivity for these graduates in the labor market and, consequently, leads employers to hire (Arkes, 1999).

The purpose of this study was to examine what, if any, the significant differences are between the income before enrollment into a CTE short-term program and employment income after graduation in relation to the labor market signals for these CTE short-term programs. The theoretical framework for this study is based on signaling theory. The signaling theory posits that “In most job markets the employer is not sure of the productive capabilities of an individual at the time he hires . . .. Nor will this information necessarily become available to the employer immediately after hiring” (Spence, 1973, p. 356). Given that an individual applicant’s productive capabilities are not easy to determine prior to hiring, employers read credential attainment signals to predict productivity, resulting in a job or a salary offer (Tan, 2014; Connelly, Certo, Ireland, & Reutzel, 2011; Spence, 1973). Spence’s (1973) work on labor markets demonstrated that job applicants engage in behaviors that reduce information asymmetry to facilitate the selection ability of prospective employers (Connelly et al., 2011; Spence,
1973). Signaling theory, initially suggested by Spence (1973), leads the study to determine if a relationship exists between the two incomes.

Fundamentally, signaling theorists argue that educational institutions classify students according to their intelligence and commitment through processes of admission requirements and grading (Tan, 2014). Signaling theory is grounded in reducing information asymmetry between two parties (Connelly et al., 2011; Weiss, 1995). Connelly et al. (2011) further explained that, “Signaling theory is useful for describing behavior when two parties (individuals or organizations) have access to different information” (Connelly et al., 2011, p. 39). In this study, therefore, the focus is to explore whether the signals of the credentials reduce information asymmetry between the employer and the graduate, resulting in better post-graduation employment income.

Spence’s (1973) theory stands in contrast to human capital theory especially as he de-emphasized the role of education for increasing worker productivity. The explanations of human capital theory, pioneered by Becker (1962) and Schultz (1961), suggest that the correlation between education and wages is due to education-enhancing productivity (Becker, 1962; Chevalier, Harmon, Walker, & Zhu, 2004; Schultz, 1961). Chevalier et al. (2004) further explained that “earnings may rise in response to education not because of any effect on productivity but simply because education may act as a signal of productivity” (Chevalier et al., 2004, p. F499). Employers, therefore, believing that education is correlated with productivity, screen potential job seekers for their education and pay higher wages to the more educated (Chevalier et al., 2004). In other words, human capital theory suggests a direct correlation between education and earnings thus undermining efficiency and productivity, which are the main reasons for higher earnings
Spence’s (1973) signaling theory focuses on education as a means to communicate the unobservable characteristics of the potential job seeker (Connelly et al., 2011; Weiss, 1995). Signaling theorists argue that schooling may reflect higher productivity without causing it, since education is rather the signal of higher productivity of educated people not the source because schools only identify the abilities of committed individuals (Tan, 2014).

In the same vein, Blaug (1976) suggested that because the labor market information is imperfect, the education level of an individual may only represent proof of higher ability to produce not necessarily a correlation between education and productivity (Blaug, 1976; Tan, 2014). In conclusion, the importance of CTE short-term training certificates lie in the fact that they validate the graduate’s higher ability to produce in a specific field thus signaling employers for higher earnings. Based on signaling theory, this study explores whether short-term CTE program graduates’ incomes show any different signals from pre-enrolment signals.

**Statement of Purpose**

This study explores the relationship between prior- and post-employment incomes of CTE graduates from short-term CTE programs, and the study considers the length of these programs, as well as the demographic characteristics of post-secondary CTE students, in the Western New York area. The award of certificates has increased more than 800% over the past 30 years (Carnevale et al., 2012). Over one million certificates were awarded in 2010 from only 300,000 certificates in 1994. This increase has continued to rise nationally where, in 2012, short-term certificates requiring up to 1 year of training accounted for 54% of the certificates earned. This trend suggests a careful
review of short-term certificates, especially because little is known about the signaling abilities of these programs with varying length in the labor market (Carnevale et al., 2012). Ewert (2013) claimed that very few studies or reports focus on these short-term certificates, especially because there is a dearth of relevant data that comprehensively captures information about these alternative credentials options (Ewert, 2013; Sykes, Szuplat, & Decker, 2014), suggesting that there is a gap for further inquiry in this important workforce development area.

Concerns about a shortage of skilled workers and an insufficient supply of technically trained workers have been raised by employers in the United States in recent years (Kahn, 2015). Kahn (2015) also suggested that the Great Recession of 2008 was caused by an increasing degree of mismatch between the skills demanded by firms and those supplied by workers, causing what is referred to as structural unemployment, which can be remedied by increasing workers’ skills (Kahn, 2015). Especially devastating during the Great Recession was that the unemployment rate for minority groups, which were relatively high. For example, while Latinos experienced a 12.6% rate of unemployment, African Americans experienced a 16.5% rate, while teens had a 26.4% rate of unemployment. By contrast, the unemployment rate for White workers was 8.7% (Carnevale, Smith, & Strohl, 2010).

Bosworth (2011) claimed that a number of national surveys are consistent in reporting that certificates from programs of at least 1 year generally offer individuals 5-10% earning advantage when compared to individuals who have no post-secondary education or training (Bosworth, 2011). By implication therefore, this earnings advantage signifies better labor market returns to recipients as well as added enhancement to family-
supporting wages. Considering that nationally there has been an increase in the awards for certificates, generally and short-term certificates in particular, and that some studies suggest earning advantages to these short-term certificates, it is therefore worthwhile to explore the relationship between prior- and post-employment incomes of CTE graduates from short-term CTE programs, which is one main purpose of this study. In this regard, the following research questions guide the study.

**Research Questions**

1. Is there a significant relationship between post-graduation employment incomes and employment incomes before enrollment in short-term CTE programs for post-secondary CTE students in the Western New York area?
2. Is there a significant relationship between post-graduation employment incomes and program length for CTE short-term program graduates in the Western New York area?
3. Is there a significant relationship between post-graduation employment incomes and the demographic composition of CTE short-term program graduates in the Western New York area?

**Potential Significance of the Study**

Between 1960 and 2000, the United States workforce more than doubled to about 141 million workers (Bosworth, 2011). This increase was correspondingly accompanied by rising educational attainment in the workforce (Bosworth, 2011). This growing labor force contributed considerably to productivity and economic growth (Bosworth, 2011). But in recent years, the educational attainment of the labor force is increasing at a decreasing rate (Bosworth, 2011). It is projected that between 2000 and 2040, the
workforce will grow at a slower pace than it did during the previous 40 years. The Bureau of Labor Statistics (BLS) projects an overall labor force growth of only 29% by 2040 (Bosworth, 2011). It is therefore not surprising, as Ewert (2013) advanced the notion that “policy makers and researchers have begun to recognize the labor market value of alternative credentials, including educational certificates and professional certifications and licenses” (Ewert, 2013, p. 1). This dissertation study explored the relationships between the two incomes of CTE program graduates (i.e., income after graduation and income before enrollment), including the relationship between income after graduation and program lengths, and also the relationship between income after graduation and demographic characteristics. This dissertation study will contribute to the existing body of knowledge in this area on the labor market value of noncredit-bearing, short-term CTE certificates in the western New York area.

Albrecht (2011), using BLS data for June of 2011, estimated that there were 3.2 million open positions in America with national employment rates hovering between 6 to 7% (Abraham, 2015). Some employers raised concerns about the shortages of skilled workers and the problem of mismatches between the skills workers have and those demanded by firms (Kahn, 2015). Other examples are given by Abraham (2015), when referring to Deloitte and The Manufacturing Institute’s Report in 2011 in which a survey found that more than 82% of manufacturers reported a serious shortage in skilled production workers. The report also stated that more than 75% of the manufacturers say the skill shortage has negatively impacted their ability to expand (Abraham, 2015). In the same vein, the Manpower Talent Shortage Report 2013 also found that 39% of U.S. employers reported hiring challenges caused by talent shortages (Abraham, 2015).
However, for many individuals seeking employment, the quickest and most practical route toward the goal of employment may not be in obtaining an academic degree, but in obtaining a certificate or credential that signifies completion of a rigorous, occupationally focused program of study for skills (Bosworth, 2011). These occupationally focused program skills would maximize these individuals’ potential in the labor market as they obtain credentials to earn a livable wage (Reese, 2011). Bosworth (2011) encouraged some particular groups, such as minority and low-income youth and working adults, to obtain college credentials that are valued in the labor market (Bosworth, 2011). Potential workers can seek specialized skills and training through a range of institutions and settings, such as post-secondary technical institutes, area vocational schools, proprietary schools, shorter-term job-training programs, and firm-based training, which might be paid for in part by public funds (Bills, 2013).

Because most certificates are typically classified by program length, this has led some policymakers and practitioners to think of course length as an expected way to classify certificates’ economic value (Carnevale et al., 2012). Carnevale et al. proposed that understanding the differences in the value of certificates based on their program length may be misleading and further explained that, “Some certificate fields that consist predominantly of short-term certificates, such as police and protective services, computer and information services, agribusiness and office management, offer large earnings premiums” (Carnevale et al., 2012, p. 21). Moreover, Rosenbaum (2003), referring to a comprehensive review of research on vocational education, concluded that throughout the vocational education literature, most findings consistently show that improved earnings do occur in situations where vocational training is directly related to job tasks.
(Rosenbaum, 2003). This view is consistent with the objectives of CTE occupationally focused program skills. In this same vein, this study seeks to contribute to the existing knowledge on earnings that occur due to CTE program trainings that are related to job skills.

**Definitions of Terms**

*Career and Technical Education Programs or Courses* – CTE or Vocational programs offer a sequence of courses to young adults with coherent and rigorous content that aligns with challenging academic standards and relevant technical knowledge, for credential attainment—P.L.109-270 (U.S.C, 2006). The New York State Education Department (NYSED) encourages the articulation of the adult noncredit-bearing career and technical education programs with related high school or after post-high school curricula. The purpose of these adult noncredit-bearing programs is to prepare students for direct entry into employment in high demand, high skill, or high-wage occupations (NYSED).

*Certification* – a permit awarded by an approving body based on an individual demonstrating through an examination process that an individual has acquired the designated knowledge, skills, and abilities to perform a particular job. The examination can be either written, oral, or performance based. Certifications are time-limited credentials that are renewed through a recertification process.

*Critical Demography* – helps to redefine the concepts of conventional demography considering aspects that do not neatly fit within its boundaries. This definition broadly captures situations in which articulating the impact of racism and sexism also includes race and sex in such a dialogue. Critical demography therefore
articulates the nature of the social structure and how it impacts upon population phenomena (Smith, 2006).

*Educational Certificate* – A permit awarded by a training provider or an educational institution based on the completion of all requirements for a program of study, including coursework and test or other performance evaluations. Certificates are typically awarded for life (like a degree). Certificates of attendance or participation in a short-term training, for example, 1 day in length, are not within the definitional scope of an educational certificate.

*License* – A permit awarded by an authority agency based on predetermined criteria. The criteria may include some combination of degree attainment, certifications, certificates, assessment, apprenticeship programs, or work experience. Licenses are held for a time-limited and must be renewed periodically.

*Postsecondary Award, Certificate, or Diploma (less than one academic year)* – “official compensation that requires the completion of an organized program of study at the after-high school level (below the baccalaureate degree) in less than one academic year (two semesters or three quarters)” (Oates, 2010, p. 2).

*Postsecondary Award, Certificate, or Diploma (at least one but less than two academic years)* – “official compensation that requires the completion of an organized program of study at the after-high school level (below the baccalaureate degree) in at least one but less than two full-time equivalent academic years” (Oates, 2010, p. 2).

*Private Returns to Schooling* – “expectation of lifetime earnings to exceed the short-term investment or the loss of time and money required for attending college” (Russell, 2013, p. 369).
Private Costs and Benefits – the price and advantages calculated by individuals to show positive returns on investment in schooling (Psacharopoulos, 1972). These personal advantages “should then have a positive impact on society through improved contribution to the labor force, political participation, and economic contributions thus the effective use of resources yields profits for individuals and society” (Russell, 2013, p. 369).

Returns on Investment – “the ratio of the net change in an investment’s value (positive and negative) to the value of the original investment” (Eisenstein, 2009, p. 983).

Stackable Credential – “an achievement that is part of a sequence of achievements that can be accumulated over time to build up an individual’s qualifications and help them to move along or up a career pathway to different and potentially higher-paying jobs” (Oates, 2010, p. 6).

Chapter Summary

President Barack Obama called on the United States to have the best-educated, most-competitive workforce in the world, and to lead the world in the percentage of Americans with post-secondary degrees and/or industry-recognized certificates and credentials by 2020 (Oates, 2010). In alignment with this policy statement, Jane Oates, the United States Assistant Secretary of Labor suggested, in a training and employment guidance letter to workforce administrators, that “In today’s increasingly competitive, dynamic, and fast-paced world economy, economic growth and broadly-shared prosperity depend upon the education and skills of the American workforce” (Oates, 2010, p. 1).

This increased emphasis by Jane Oates on workforce development reinforces the need for further research in this area. This study explores the relationship between prior- and post-employment incomes of CTE graduates from short-term CTE programs, and it considers
the length of these programs as well as the demographic characteristics of post-secondary CTE students in the Western New York area. This effort will contribute to the existing understanding of the certificate values related to short-term CTE program graduates in relation to the students’ incomes before enrolling in short-term certificate programs.

This study has five chapters. The first chapter reviewed the research problem, the purpose of the study, the research question, and the potential significance of the study examining the relationships between the two incomes of CTE program graduates (i.e., income after graduation and income before enrollment), including the relationship between income after graduation and program lengths, and also the relationship between income after graduation and demographic characteristics. The chapter concluded with definitions of terms pertinent to this study. A review of the literature on Career and Technical Education is presented in Chapter 2. The research design, methodology, and analysis is discussed in Chapter 3. Chapter 4 presents a detailed analysis of the results and findings, and Chapter 5 discusses the findings, implications, and recommendations for future research and practice.
Chapter 2: Review of the Literature

Introduction

This study explores the relationship between employment income of CTE graduates from short-term CTE programs, the length of these programs, and the demographic characteristics of post-secondary CTE students in the Western New York area. Although community colleges and other post-secondary, noncredit-bearing institutions highlight the benefits of diplomas and certificates (Jepsen, Troske, & Coomes, 2014), the benefits are frequently based on anecdotal evidence rather than rigorous empirical analysis (Jepsen et al., 2014). Few studies have looked at the effects of certificates on labor market outcomes, but these results are often inconclusive, especially as most studies are based on small samples of certificate recipients drawn from national longitudinal surveys (Jepsen et al., 2014).

With the growing importance of these awards, it is important to document the returns associated with this form of human capital investment (Jepsen et al., 2014). Post-secondary institutions for CTE programs can be seen as a response to workforce priorities. Carnevale et al. (2012) indicated that about 36 million American workers who attended college did not complete their degree. Certificates, on the other hand, can be achievable incrementally with convenient, flexible learning units that fit training systems that substantially support a successful student’s career achievement plan. Carnevale et al. (2012), again, pointed out that certificates do add value to degrees, explaining that in combination with a certificate, degrees have “a 6 percent premium at the Associate’s
degree level, and a 3 percent at the Bachelor’s degree level . . .” (Carnevale et al., 2012, p. 7).

Between 2000 and 2010, short-term certificates increased by 151% nationally (Dadgar & Weiss, 2012). The mix of credential types awarded at community colleges varies greatly across the nation, and they have also changed over time even within the states. For example, in 2010, only 0.1% of credentials awarded in New York State were short-term certificates, compared to 62.9% in Kentucky (Dadgar & Weiss, 2012). The dramatic increase in these short-term certificate awards suggests careful consideration of distinguishing between certificate value based on short-term certificate programs and lengths. Dadgar & Weiss (2012) also cautioned that even if a program was not increasing wages and employment for its graduates, it could still be beneficial in other ways, such as providing entry into an occupation desired by a student for other, non-economic reasons.

Dortch (2014) suggested that alternative credentials, such as educational/professional certificates and licenses, are associated with a statistically significant wage premium for populations with no post-secondary degree when compared to others who have comparable levels of formal education for the sub-baccalaureate populations. However, Dadgar & Weiss (2012), while supporting the view further, determined that unlike associate degrees and long-term certificates, short-term certificates have little or no effect on wages in most fields of study, when compared with earning some credits and leaving college without a credential (Dadgar & Weiss, 2012). As an overview to the literature review, several findings on post-graduation employment for post-secondary institutions have shown empirical evidence that enrollment in 2-year community colleges increased employment earnings for certificate program attendees.
This suggests that even though workforce development through training is important, earnings as a result of gainful employment for economic self-sufficiency is equally important (Dadgar & Weiss, 2012; Hollenbeck, 2011; Jacobson, 2011; Jepsen et al., 2014; Marcotte, 2010; Schneider, 2013).

When the Great Recession of 2008-2009 is put into perspective, employment earnings for economic self-sufficiency became even more necessary. This is especially so because the substantial rise in unemployment triggered renewed interests in workforce and labor market conditions and highlighted increased attention to government workforce-development policies (Barber, 2011; Elsby et al., 2011; Katz, 2014; Neumark & Troske, 2012; Wandner & Eberts, 2014). Workforce development programs, such as the Carl D. Perkins CTE Act, reauthorized in 2006, provides federal resources to help individuals gain the academic and technical skills needed to be successful in today’s workforce (Brand & Valent, 2013).

This act has been instrumental in the transformation of vocational education into CTE as an important component of a college and career-readiness education because it offers academically rigorous pathways for students with the opportunity to learn in context. CTE has become a viable approach to ensure that students are ready for both careers and college in an economy that requires well-trained and highly skilled professionals (Brand & Valent, 2013).

On the other hand, a separate act, known as Workforce Investment Act of 1998 (WIA), is the primary federal program that supports workforce development today. Congress created the WIA program to facilitate a system that could readily connect employment, education, and training services to better match job seekers with labor
market needs (Governmental Accountability Office [GAO], 2005). Workforce development programs use a combination of education and training services to prepare individuals for work and to help them improve their prospects in the labor market and, consequently, grow the economy (GAO, 2014). This chapter identifies and examine the empirical literature on CTE in relation to the research questions guiding this study. The literature review also adds context to some existing views in the subject area of post-secondary CTE, short-term programs with sub-baccalaureate credentials, and the chapter ends with a brief summary.

Research Questions

1. Is there a significant relationship between post-graduation employment incomes and employment incomes before enrollment in short-term CTE programs for post-secondary CTE students in the Western New York area?

2. Is there a significant relationship between post-graduation employment incomes and program length for post-secondary CTE short-term program graduates in the Western New York area?

3. Is there a significant relationship between post-graduation employment incomes and the demographic composition of post-secondary CTE short-term program graduates in the Western New York area?

Post-secondary sub-baccalaureate credentials. As people begin to question the value of the bachelor’s degree because of the failure of some students to launch adult lives and careers after earning such degrees, attention is drawn to more efficient ways to earn post-secondary credentials associated with middle-class earnings (Schneider, 2015). One of the advances in CTE worker-retraining programs has been the development of
accelerated programs as well as short-term programs designed to efficiently and quickly return individuals to the workforce (ACTE, 2010). These programs provide people with an opportunity to upgrade and develop their skills in a fast-paced, rigorous academic, as well as technical, educational environment. Such options attract individuals who are unable to invest the time or money for full-time, traditional post-secondary programs, which often take up to 2 years to complete (ACTE, 2010).

Horstrup (1981) conducted a descriptive study to define and identify different types of short-term CTE training programs in community colleges and to report on the benefits of the programs while making comparison to long-term offerings. Because this was an unresearched area in the 1980s, the study was more of a feasibility study with no hypothesis to test because the descriptive study was intended to generate a hypothesis (Horstrup, 1981). The study took place with programs in trade and industrial subjects in the Portland, Oregon area, where on-site interviews were performed in selected training projects at five community colleges. A number of providers were interviewed as well as the users of short-term and long-term vocational education programs.

Horstrup (1981) concluded that while both short- and long-term training programs met the critical needs of the workforce, the short-term training programs were both underdeveloped as well as underutilized. The study also recommended a strong need for refining existing guidelines to effectively identify models of short-term certificate programs (Horstrup, 1981). Even though there has been a considerable rise in the award of short-term certificates nationwide, to date very few studies or reports focus on this education or training option, thus creating a gap the literature specifically devoted to
noncredit-bearing, sub-baccalaureate, post-secondary short-term certificate programs (Carnevale et al., 2012; Millard, 2014).

This study contributes to the literature on CTE short-term program certificates by examining the relationship between the income changes that occur students graduate from a noncredit-bearing, sub-baccalaureate, post-secondary short-term certificate programs in the western New York area. The following subsections in this chapter are provided to give an overview of the literature on employment incomes, program lengths, and demographics. The headings serve as a guide to help group various studies based on the emphasis in these categories rather than pointing to specific topics.

**Literature on employment income.** The earnings of workers with a post-secondary education have grown substantially since the early 1980s, relative to those of their peers with a secondary education (Marcotte, 2010). In an earlier study, Marcotte (2000) engaged two cohorts of students from the National Longitudinal Youth Surveys (NLYS) in 1981 and 1993. Marcotte (2000) found an actual earnings difference of $4,693 between cohorts. In other words, the actual earnings difference between the 1981 cohort of students who attended college compared with those who completed high school was $10,477, while the 1993 cohort earnings difference was $15,170. The comparison was done in 1993 nominal dollars. Marcotte (2010) suggested that some researchers explained this increase in relative earnings as the result of shifts in the structure of demand in the labor market that favors workers with more skill (Marcotte, 2010).

In the same vein while some scholars suggested that sub-baccalaureate credentials enjoy significant wage premiums compared to others with comparable levels of formal education for the sub-baccalaureate populations (Dortch, 2014; Grubb, 1995, 1997,
1999; Schneider, 2015; Veum, 1995). Other scholars contended that there is little
evidence to hold this notion as empirically conclusive (Beach, 2009; Dadgar & Weiss,
2012; Kane & Rouse, 1995; Marcotte, 2010). Other scholars further suggested that even
though education has an important effect on wages, it is not clear if education has only a
signaling ability or if education actually raises productivity, especially if productivity is a
determinant for higher wages (Chevalier et al., 2004; Schulz, Chowdhury, & Van de
Voort, 2013).

Community colleges offer a variety of each of these three types of awards:
degrees, diplomas, and certificates (Jepsen et al., 2014). To be specific, technical
programs that typically require one or two semesters of course work usually award
certificates. Diplomas typically require more than 1 year of study, and they are also the
most common in technical fields (Jepsen et al., 2014). Whereas associate degrees,
depending on the field of study, require 60 to 76 college credits. This study aimed at
examining the relationships between pre-enrollment and post-graduation incomes, and
program length, along with demographic characteristics. In this light, the study explored
income earnings difference between individual students resulting from graduating with
short-term certificates from CTE noncredit-bearing sub-baccalaureate programs in the
Western New York area.

Jepsen et al. (2014), using administrative data from the Kentucky Community and
Technical College System (KCTCS), the National Student Clearinghouse for transfer
data, and Unemployment Insurance (UI) wage record data, studied the labor market
returns to community college degrees, diplomas, and certificates. Focusing on cohorts of
students who started at KCTCS from summer 2002 to spring 2003, and summer 2003 to
spring 2004, the total sample population for the study was 25,453 (8881 men and 16,572 women). The period of the earnings data was from 2000 to 2008. Most of the post-schooling observations were prior to the most recent recession of 2008-2009 (Jepsen et al., 2014).

A regression analysis was used with the Mincerian equation or traditional Mincer-type schooling equation. Jacob Mincer, a labor economist was the first to introduce this form of modeling for earning gains resulting from education. This equation, widely used by labor economists, is often known as the traditional human capital model (Jepsen et al., 2014). The model was used because it is commonly used to estimate the returns to schooling in the literature, and it can easily be used for comparison with previous estimates of the returns to community college (Jepsen et al., 2014). The model in the study of Jepsen et al. (2014) takes the form:

\[ EARN_i = \beta \text{AWARD}_i + \delta \text{DEMOG}_i + \epsilon_i, \]

where EARN, the dependent variable, is either annual or average quarterly earnings from the most recent 1-year period, which was the fourth quarter of 2007 through the third quarter of 2008 (Jepsen et al., 2014). AWARD is a set of three dichotomous variables for highest award (associate degree, diploma, or certificate). DEMOG is a set of person-specific demographics, such as age, gender, and race/ethnicity (Jepsen et al., 2014).

Results revealed that associate degrees and diplomas were correlated with increases in employment of 12-15% but employment returns for the just the women in this category was approximately 20%, while certificates, on the other hand, had employment returns of 9% for both men and women (Jepsen et al., 2014). Other findings revealed that associate degrees and diplomas had quarterly earnings returns of nearly
$2,400 for women and $1,500 for men, compared with much smaller returns of $300 per quarter for certificates for both men and women (Jepsen et al., 2014). There were substantial heterogeneity in returns across fields of study (Jepsen et al., 2014). Women also earned higher returns from diplomas than men with quarterly earnings of $1,914 versus $1,265, respectively (Jepsen et al., 2014). However, because men and women had different fields of study at KCTCS, one explanation for the gender differences in returns could be that returns varied by fields of study, especially because the highest returns for associate degrees and diplomas were for health-related fields with approximate returns between $2,000-$4,000 per quarter (Jepsen et al., 2014).

The comparison on earnings in the Jepsen et al. (2014) study was based on all students’ participation in the various programs and their employment outcomes. Jepsen et al. (2014) also analyzed earnings by gender including sensitivity analysis for various age groups. This dissertation study compares the individual income changes from enrollment incomes to employment incomes only in short-term certificate CTE programs. While Jepsen et al. (2014) used community measured student participation in community college credits, this study uses noncredit-bearing post-secondary certificate outcomes based on actual lengths of the programs. Since demographics are useful in understanding the participants in these programs and the various income outcome, this study looks at gender differences in income that was also considered in the Jepsen et al. (2014) study.

While examining the effects of enrollment in community colleges on students’ subsequent earnings, Marcotte (2010) used data from a 2000 follow-up study of the National Education Longitudinal Survey (NELS). The population was a follow up of high school cohorts who enrolled in either 4-year colleges or 2-year community colleges.
Interviews were conducted in 1990, 1992, 1994, and 2000. By 2000, the data was collected from a sample population of 11,559. To identify the earnings effects of community college educations, Marcotte estimated a series of models with the following form:

$$\ln w_i = \alpha + X_i \beta_1 + \text{HD}_i \beta_2 + \text{CR}_i \beta_3 + \epsilon_i,$$

where $\ln w_i$ is the natural log of an individual’s labor earnings. $X_i$ is a vector of standard demographic controls. HD$_i$ is a vector of dummy variables measuring highest post-secondary degree/credential earned by a respondent. CR$_i$ is a measure of the full-time equivalent years of post-secondary education for those who never received a degree or certificate (Marcotte, 2010). The coefficients in $\beta_2$ measure adjusted differences in earnings for those with post-secondary degrees and credentials, compared to those with no post-secondary enrollment (Marcotte, 2010). The coefficients in $\beta_3$ measure earnings differences associated with various levels of enrollment for those without degrees, and hence reflect only enrollment effects (Marcotte, 2010). Marcotte estimated the effects of credits earned separately from credentials because community colleges are often used as a means for students to engage in study not necessarily leading to a degree or a certificate (Marcotte, 2010).

Marcotte (2010) found consistent evidence of wage and salary effects for both credits and degrees, especially for women. He also found that about one third of those enrolling in community colleges earned a certificate or degree, with women more likely to receive a degree or certificate (Marcotte, 2010). There was no substantial evidence that enrollment in vocational rather than academic coursework had a particularly beneficial effect (Marcotte, 2010). This view suggests that while there are benefits to post-
secondary education participation at the sub-baccalaureate level, there are no substantial differences in earnings for vocational or academic students without some form of a credential. Even though Marcotte examined sub-baccalaureate effects for both credit- and degree-level earnings for vocational or academic students, this dissertation study examines only noncredit-bearing, sub-baccalaureate, post-secondary, short-term certificate program graduates in relation to changes in their pre and post-graduation earnings.

Dadgar and Weiss (2012) considered the research question, “To what extent do sub-baccalaureate credentials (short-term certificates, long-term certificates, and associate degrees) increase the wages of students who earn them, including the effect of these credentials on increasing the likelihood that students will be employed?” Dadgar & Weiss (2012). Dadgar & Weiss used administrative data from community college transcript records from the 2001-2002 cohort of first-time students in the state of Washington. The population sample size was limited to students who had wage records both prior to enrollment and after exit from the community and technical colleges.

The resulting population sample size was 24,221 students. Students were tracked through the 2008 to 2009 academic year to examine the labor market returns to specific types of community college credentials. Their estimates of the returns for credentials included both the quantity of schooling necessary to earn each credential, including the additional market value of the credential itself (Dadgar & Weiss, 2012). Dadgar & Weiss (2012) used regression analysis with a series of models based on the Mincerian equation using the fixed-effects model.
The fixed-effects model was used to take advantage of the existence of quarterly information on wages (Dadgar & Weiss, 2012), which helped to compare the trajectory of wages among students who earned a specific type of credential and students who left college without earning any credentials (Dadgar & Weiss, 2012). Results revealed that women had 14% higher quarterly wages for obtaining a long-term certificate and 8% higher quarterly wages for obtaining an associate degree, compared with attending a college and not obtaining a credential (Dadgar & Weiss, 2012). Men had a modest return of 2% increase in quarterly wages for long-term certificates and a 3.6% increase in quarterly wages for obtaining an associate degree (Dadgar & Weiss, 2012).

Findings also revealed that short-term certificates had no overall labor market value in terms of increasing wages (Dadgar & Weiss, 2012). Even though Dadgar and Weiss (2012) conclusions were consistent with Marcotte’s (2010), it is unclear if further break down by short-term certificates would have yielded different results since allied health, business and marketing, and nursing had various short-term certificates, and they were significant. Short-term certificates vary in lengths and skill levels and across fields of study. This dissertation study considers these programs by length and field of study including gender, age and race characteristics of participants in these short-term certificate programs.

The conventional wisdom about learning to earn may not hold for every type of education, even though the economic value of formal schooling has been evident for some time (Grubb, 1997). In an earlier study to determine the returns on education and training in the sub-baccalaureate labor market, Grubb (1997) used national data from a Survey of Income and Program Participation (SIPP). The data consisted of information
on the educational attainment and income for populations of: 14,537 (7,981 males; 6,556 females); 10,384 (5,452 males; 4,952 females); and 20,539 (10,600 males; 9,939 females) for the calendar years 1984, 1987, and 1990, respectively. The SIPP respondents were aged 25-64 years (Grubb, 1997).

The method used was a regression analysis where the dependent variable or the respondents’ earnings was a function of independent variables such as levels of education, age, gender, race (Grubb, 1997). Among others, the results for both certificates and associate degrees indicated that those who received each award saw relative increases in earnings (Grubb, 1997). This indication is relevant to this dissertation study because the market value of short-term sub-baccalaureate certificates is considered. Grubb (1997) also found that the benefits of these sub-baccalaureate credentials were generally positive and statistically significant at a 5% level. The coefficients for those with some college but without a credential were consistently insignificant, but Grubb contended that completing 1 year of post-secondary with a certificate is more beneficial than without a credential (Grubb, 1997).

Grubb (1997) also concluded that the benefits of completing some post-secondary education but failing to earn credentials were much lower for women. Grubb also maintained that there were substantial variations in returns among fields of study, leading to the idea that individuals who do not find employment related to their field of study also have lower returns (Grubb, 1997). These findings are supported by Carnevale et al. (2012), who claimed that short-term certificates programs are cost-effective and are progressively seen as a way of increasing post-secondary educational attainment (Ewert & Kominski, 2014). This dissertation study looks at the relationships that exist between
incomes of students as they obtain a post-secondary CTE short-term certificate in relation to their prior incomes before enrolling in these programs.

**Literature on program length.** Carnevale, Rose et al. (2012) suggested that most post-secondary CTE short-term programs offer career-based certificates. For most post-secondary CTE programs with certificates, there are federal requirements on hours of training to earn a certification (Han et al., 2014). Many states are at liberty to also require additional training (Han et al.). Han et al. (2014) looked at the association between state regulations, training length, and perceived quality and job satisfaction among certified nursing assistants. Nursing assistant programs are usually noncredit-bearing in most CTE post-secondary institutions. Han et al. (2014) used a National Nursing Home Survey and a National Nursing Assistant Survey including data on state regulations of certified nursing assistant training. The population for the study was 2,897 certified nursing assistants in 580 nursing homes. Han et al. (2014) used binomial logistic regression models where state regulations were related to initial training and job satisfaction among certified nursing assistants.

Han et al. (2014) found that states requiring additional initial training hours were strongly associated with high-quality training with a statistically significant value (p = 0.02). Job satisfaction for these nursing assistants was greater. This led Han et al. (2014) to conclude that nursing assistants with additional hours of training for their certificates performed better and report higher job satisfaction, and they had less turnover than their peers in states with lower hour requirements for the same certification. Han et al. (2014) focused on higher job satisfaction and performance, but this study focuses on the relationship of income changes brought about to graduates after participating in a short-
term certificate program in the Western New York area. The nursing assistant program in this research study is considered within the state-approved length that is required.

The purpose of a study conducted by Tillman & Tillman (2008) was to examine the extent to which CTE program graduates were employed in occupations related to the training received during their secondary and or post-secondary education. Tillman & Tillman (2008) specifically sought to answer the question whether there will “be substantial agreement between the occupational group a CTE student enrolled in and the occupational group in which a CTE graduate gains employment” (Tillman & Tillman, 2008, p. 26). The relevance of the Tillman & Tillman (2008) study lies in the employment gains to CTE graduates in different program groups, which unveils the heterogeneity inherent in CTE program participation in different occupational areas, requiring different length in program participation.

The population was a convenience sample with participants above 18 years of age who had electronic email addresses and who were registered members of the National Technical Honor Society organization (Tillman & Tillman, 2008). A total sample size of 19,270 participants was located, but only 1066 individuals actually responded with usable data for analysis (Tillman & Tillman, 2008). Using a descriptive form of analysis, Tillman & Tillman (2008) found that in all occupational areas, 40% of the total respondents indicated their employment at the time of this study was related to the CTE training received in their technical education programs, while 31.6% were not employed in their CTE training-related field, and 28.4% were unemployed. The largest group employed were in the health-related fields, followed closely by office administrative/clerical services field (Tillman & Tillman, 2008). This dissertation study
only studies the population that have graduated from heterogeneous lengths in CTE short-term programs. The study hopes to address the link between their postgraduate incomes to their prior incomes before enrollment.

Polizzi & Ethington (1998) used data from an existing self-report instrument, which was The Community College Student Experiences Questionnaire (CCSEQ). This instrument measured both students’ involvement in the quality of effort in various college experiences on one hand, and gains toward educational goals attainment, on the other hand. The population studied by Polizzi & Ethington consisted of 3,161 students from part of a national database for 1990-1994. The CCSEQ consisted only of vocational students who attended four groups of vocational programs in community colleges including business, health, technical (computer programming and industrial technology), and trades (construction trade and automotive mechanic) (Polizzi & Ethington, 1998).

Only group sizes of 200 respondents or more were selected to facilitate vocational group comparisons. This reduced the sample size to 2,528, and 1,891 became the final count when only valid entries across variables were chosen (Polizzi & Ethington, 1998). This was distributed by groups as follows: business (433), health (729), technical (296), and trades (433). The purpose of Polizzi & Ethington (1998) study was to investigate and compare the relationship between the quality of effort in various college experiences and gains toward educational goals, which generated 14 independent variables.

The method used was regression analysis (ANOVA), which indicated significant results, showing that all four vocational groups differed in the amount of effort students exerted in a particular college experience and also in perceived gains in career preparation (p < .01) (Polizzi & Ethington, 1998). This further suggests that CTE
students may not be viewed as a group having the same unique characteristics (Polizzi & Ethington, 1998). This study examines the relationships between CTE graduate employment income, short-term program length, income before enrollment, and the demographics of these short-term program participants.

**Other influential aspects on CTE participants.** Because CTE is a broad term with varying perspectives ranging from workforce education to technical education to secondary and post-secondary career educational programs (Rojewski et al., 2008), this section looks at some aspects that influence success of CTE participants. For example, they are transition experiences, enrollment, retention, and completion rates including workforce needs all interact to influence successful CTE programs. This dissertation study engaged participants with certificates from short-term graduate CTE programs to explore the association in value for these short-term certificates to determine if there exist better signals to employers after completing post-secondary short-term certificates measured in terms of wages.

Elffers (2012) studied the link between a set of common risk indicators, such as students’ supportive resources and school experiences during transition, to post-secondary vocational education in the Netherlands. The population included 1,438 first-year students (2008-2009) entering senior vocational education (SVE) in the Netherlands who were ages 16 and older (Elffers, 2012). For data collection, a questionnaire was prepared based on socio-demographic background characteristics as well as measures of personal circumstances (Elffers, 2012). All psychometric qualities of the scales regarding students’ social capital and school experiences were examined with statements on a five-point Likert-type scale.
Results indicated that most socio-demographic risk indicators related to dropout patterns that aligned with access to supportive resources in students’ social networks outside of school, as well as less access to supportive resources within the school (Elffers, 2012). In addition, personal circumstances associated with increased risk for dropping out correlated with negative school experiences (Elffers, 2012). Attributes associated with this include students from lower-educated and/or lower-income families or students with run-ins with the law (Elffers, 2012). Elffers (2012) pointed to supportive resources in the students’ social networks as an important aspect influencing dropout rates for students in vocational programs. This dissertation study, on the other hand, uses a similar group from lower-income families but the focus is on incomes because of short-term certificate programs in relation to their prior incomes.

In a qualitative study, Wai-Ling Packard, Leach, Ruiz, Nelson, & DiCocco (2012) examined problems experienced by CTE high school graduates as they encountered challenges during school-to-work transitions. A purposeful population sample of 40 graduates from three high schools, in the northeastern region of the United States, participated after graduation in baseline surveys and phenomenological interviews with follow-up interviews were conducted at 6 months and 1 year after their graduation (Wai-Ling Packard et al., 2012). The study Wai-Ling Packard et al. (2012) study adds a dimension to CTE, which characterizes high school or secondary school CTE program graduates as job seekers in the labor market. Wai-Ling Packard et al. (2012) used five experts to analyze the responses. The recurring themes or main ideas shared by the respondents included job loss by the responders. Other themes that emerged included altered career plans by 50% of the respondents, while only 25% of the respondents
reported having relevant jobs. Another 35% of the respondents reported limited access to
college due to lack of funds, while 40% of the respondents expanded their career options
by going to college (Wai-Ling Packard et al., 2012).

The Wai-Ling Packard et al. (2012) study brings to the forefront lived experiences
of graduated CTE students, post-graduation from high school, where 40% of the
participants expanded their career options by going to college (Wai-Ling Packard et al.,
2012). The findings of Wai-Ling Packard et al., (2012) suggest a link between secondary
CTE programs and post-secondary CTE programs as they explore expanded career
options for further education by pursuing short-term, post-secondary CTE program
certificates. This research study, however, looks at the value of short-term, post-
secondary CTE program certificate graduates.

In another study, Shaw (2012) comparatively examined the increased post-
secondary enrollment, retention, and completion rates of CTE students in the
Massachusetts Tech Prep program to non-Tech Prep participants (Shaw, 2012). The
population of the study was 10,854 high school graduates between 2004 and 2008. The
method for data analysis was a multivariate statistical analysis of students’ college
enrollment, retention, and completion outcomes. Demographic and descriptive data was
processed using frequency statistics, while logistic regression was used to test the
outcomes (Shaw, 2012).

Shaw’s (2012) findings provide evidence to indicate a significant relationship
between Tech Prep participants’ enrollment, persistence, and graduation in the studied
post-secondary institutions. There was a statistical significance between three dependent
variables (enrollment, retention, and graduation) and seven independent (attendance,
income, discipline, gender, race, special education needs, and work-based learning participation, which are considered influencing factors (Shaw, 2012). It must be noted that attendance, income, discipline, gender, race, special education needs, and work-based learning participation, which are considered influencing factors, were controlled in the study (Shaw, 2012). Shaw’s (2012) study points to some influencing factors in the CTE program phase that are necessary to produce work-ready postgraduates. This dissertation study is centered on the relationships between changes in income due to participating in CTE short-term certificate programs.

Bartlett, Schleif, & Bowen (2011) investigated the issue of a workforce needs assessment as a component of the evaluation of CTE programs’ activities by Advanced Technological Education (ATE) projects. Bartlett et al. (2011) posited that aligning the need for educational programs with desired workplace outcomes is increasingly a visible trend in CTE (Bartlett et al., 2011; Rojewski, 2002). ATE, under the direction of National Science Foundation (NSF) is a congressionally mandated public law (PL 102-476). It was designed to improve and expand educational programs for technicians to work in high-tech and STEM (science, technology, engineering, and mathematics) fields (Advanced Technological Education [ATE], 2013). Advanced Technological Education focuses on secondary and the post-secondary schools. The Bartlett et al. (2011) study drew a sample population from an annual survey of existing data conducted by the Western Michigan University Evaluation Center. The sample population was 103 ATE projects, which had a strong link to CTE, because of the vocational component that ATE projects and CTE both share.
A summary of how ATE projects are distributed amongst institutions showed that, of the 103 projects, 71.8% were in community colleges, 16.5% were in 4-year colleges, and 12% were distributed across professional associations and societies, nonprofit organizations, and K-12 school districts (Bartlett et al., 2011). The important aspect for which these projects were assessed was aligned with the need for educational programs with desired workplace outcomes. In this regard, of the 103 ATE projects, 52 or 50.5% reported conducting workforce assessments for continuous improvements (Bartlett et al., 2011). To further analyze the process on how the workforce need was done specific projects that responded showed that, of 45 projects, 87% reported using secondary data in the form of reports and studies that were written by others, including state agencies and specific industry groups, most frequently (Bartlett et al., 2011).

Of the 39 projects, 75% indicated that they were engaged directly in data collection activities, while of 28 of the projects, 72%, reported collecting data from a local source (Bartlett et al., 2011). The study highlights workforce needs assessments by projects that need and use employers. This aspect is valuable because CTE, as well as ATE, are designed to efficiently and quickly return individuals to the workforce (ACTE, 2010). Any attempt therefore to improve workforce needs through a process of continuous assessment, as a component of the evaluation will enhance CTE programs’ activities because the value of graduates to the workforce’s needs depends on the quality of the program from which the students graduate. This dissertation study focuses on the value of short-term program certificates and their signaling abilities in relation to student graduate employment prior to participating in these programs.
Methodological Review

There were two phases used in the selection process of the empirical literature used for this study. The focus of the first review was to identify and examine the empirical literature on CTE in general. The Eric-ProQuest, ProQuest Nursing & Allied Health Source, APA psycNet, and EBSCO host databases were used for searches that included one, or a combination of, the following keywords: “vocational,” “education,” “transition,” “counselling,” “post-secondary,” “career and technical education,” and “CTE.” Given that career and technical education is still evolving in the area of empirical studies, the search limiters were less restrictive but were limited to peer-reviewed journals between the years 2000 and 2014. There were 101 results from peer-reviewed journals, and 44 dissertations were found. However, based on the topic groupings by substance relevance, there was a narrowing process where only 23 empirical studies were first reviewed. Many historical and conceptual opinion papers were avoided in this review.

In the second and last phase of the review selection, the references of the reviewed articles were used to select articles that aligned with this study’s research questions. As such, studies that dealt with sub-baccalaureate credentials, employment income, program length, and other influential aspects on CTE participants were reviewed which brought the final count to 31 articles reviewed for this chapter. CTE is yet to be recognized as an established alternative to the traditional educational path, which echoes a need for more research on the topic. These issues are discussed with the backdrop of how CTE meets the economic and educational challenges of noncredit-bearing post-
secondary CTE certificate program students from economically disadvantaged backgrounds.

Reviewed articles selected for this study mostly dealt with sub-baccalaureate credentials, employment income, program length, and other influential aspects on CTE participants. This research literature identified several quantitative studies on the CTE for example, (Grubb, 1997; Marcotte, 2010; Dadgar and Weiss, 2012; Jepsen et al., 2014). These studies used secondary longitudinal data sets from credit bearing post-secondary institutions such as 2-year and 4-year post-secondary institutions to examine if there were relative increases in earnings for both certificates and associate degrees using regression analysis. The current study used longitudinal data sets from noncredit bearing post-secondary institution to determine income changes due to participating in CTE short-term programs also by the use of regression analysis.

Other quantitative studies such as Han et al., (2014) used survey questionnaire on a convenient population in assessing higher job satisfaction and performance due to increased program length while Tillman & Tillman, (2008) also used survey questionnaire to descriptively examine employment gains to CTE graduates in different program groups requiring different length in program participation. The Tillman & Tillman, (2008) study also unveiled the heterogeneity inherent in CTE program participation in different occupational areas. The current study while recognizing the difference in the length of CTE short term programs further examined the relationship between CTE post-graduation incomes and program lengths using the regression analysis.
Elffers (2012) in another quantitative study used a survey questionnaire prepared based on socio-demographic background characteristics to examine socio-demographic risk indicators related to dropout patterns in the Netherlands while Shaw (2012) comparatively examined the increased post-secondary enrollment, retention, and completion rates of CTE students in the Massachusetts Tech Prep program to non-Tech Prep participants. In a qualitative study, Wai-Ling Packard et al., (2012) used a purposeful population sample to examined problems experienced by CTE high school graduates as they encountered challenges during school-to-work transitions. The recurring themes or main ideas shared by the respondents included job loss by the responders as well as limited access to college due to lack of funds. These aspects are considered and highlighted in the current research study as skills gaps existing in low income population that need post-secondary CTE short-term program certificates that signal employers to higher and pay better wages.

Conclusion

This chapter covered the major research literature relating to post-secondary CTE earnings after graduation. The body of research showed that sub-baccalaureate credentials enjoy significant wage premiums compared to others with comparable levels of formal education for the sub-baccalaureate populations (Dortch, 2014) and that community colleges, including post-secondary institutions granting sub-baccalaureate credentials, are extremely heterogeneous, with many institutional types having varied programs that offer multiple student pathways (Belfield & Bailey, 2011). “There is strong evidence that associate’s degrees and years of community college education yield extra earnings compared to high school graduation. There is also evidence that vocational
certificates and basic credits contribute positively to subsequent earnings” (Belfield & Bailey, 2011, p. 49).

While the research is settled on the gains to obtaining an associate degree and long-term credential, it is inconclusive or mixed regarding the returns on short-term certificate programs. This study explores the association between post-graduation employment income earnings and earnings before enrollment in short-term CTE programs for post-secondary CTE students in the Western New York area. The next chapter provides a detailed plan of the research method, and it provides the research context, research participants, and the instruments used in this study.
Chapter 3: Research Design Methodology

Introduction

This study explores the associations between the employment income of CTE graduates from short-term programs in relation to their income prior to enrollment, program length, and demographic characteristics for post-secondary CTE students in the Western New York area. This chapter outlines the design of the research methodology by discussing the general perspective of the study, the research questions guiding the study, and the research context including the research participants involved. The data collection process includes how the researcher proposed to analyze the data for the study, and the chapter text ends with a brief summary.

The choices made by students to enroll in CTE short-term programs impact students’ employment income after completion of their programs. The aspect of whether demographic variables can predict employment income are considered for CTE students who graduated from short-term CTE programs in a post-secondary institution in the Western New York area from July 1, 2010 to June 30, 2015. The study explores the associations between employment income of CTE graduates from short-term programs in relation to their income before enrollment, program length, and demographic characteristics of the participating students. To guide the analysis of the relationships inherent in the short-term CTE program contributions to the employment income of graduate students from this post-secondary institution, this study sought to find answers to the following questions.
Research Questions

1. Is there a significant relationship between post-graduation employment incomes and employment incomes before enrollment in short-term CTE programs for post-secondary CTE students in the Western New York area?

2. Is there a significant relationship between post-graduation employment incomes and program length for CTE short-term programs graduates in the Western New York area?

3. Is there a significant relationship between post-graduation employment incomes and the demographic composition of CTE short-term programs graduates in the Western New York area?

The selection of a non-experimental, quantitative method approach to analyze this secondary data set was most appropriate for this study, because the data set was available and could be acquired conveniently. Moreover, analysis of the data set can be best explained by describing the relationships inherent in the data set through this method. Furthermore, Huck (2012) suggested that the population in the data set can best be described in terms of its variability using statistical measures. In this regard, this study used descriptive analyses to examine the employment income and the demographics of students who graduated from short-term CTE programs. Summarizing the patterns in a data set helps to show inherent tendencies that may not be noticeable otherwise. The study also used multiple regression analysis to explore the relationships between the dependent variables and the independent variables, which characterize the student’s individual circumstances. The independent variables included income before enrollment, program length, gender, race, and age. To further support the choice of using a
quantitative methodology for this study, Mangal & Mangal (2013) suggested that the study of a relationship between two sets of data, including the direction and magnitude of its effect, can best be explored through correlational representation.

**Research Context**

The context of this study covers a city located in the Western New York area with an estimated population size of more than 200,000 residents according to the estimates by the 2013 U.S. Census Bureau. The population of interest were students attending a public post-secondary institution that is tuition free and admits economically disadvantaged and academically challenged students into noncredit-bearing CTE short-term programs. The purpose of the short-term programs is to give students opportunities for career pathways leading to employment or higher education.

The total annual student enrollment of the institution ranges between 1,300 and 1,500. Of this total, CTE short-term program student enrollment ranges between 450 and 600. In addition, the academic preparatory programs at the institution, such as high school equivalency examinations, English for speakers of other languages, and prevocational preparatory program courses, increase the enrollment range by 850 and 900 students. These preparatory courses are essential in providing adult students with the needed basic education in English and math skills, which are necessary to help them progress in their choice of a career path. Only student graduates from the CTE short-term programs, who self-reported employment after CTE short-term program completions were considered for this study. Table 3.1 shows a summary list of CTE programs that this study includes. The programs require a duration of less than 1 year of instruction to gain certification in their respective occupational areas, as determined by NYSED.
Table 3.1

Summary of CTE Program Offerings

<table>
<thead>
<tr>
<th>CTE Program Offering</th>
<th>Required Hours</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security Guard</td>
<td>24</td>
<td>SecGuard</td>
</tr>
<tr>
<td>Medical Secretary Accelerated</td>
<td>120</td>
<td>MSecAccel</td>
</tr>
<tr>
<td>Home Health Care</td>
<td>128</td>
<td>HHA</td>
</tr>
<tr>
<td>Pharmacy Technician</td>
<td>147</td>
<td>PharmTech</td>
</tr>
<tr>
<td>Child Care Development</td>
<td>166</td>
<td>CDA</td>
</tr>
<tr>
<td>Nursing Assistant</td>
<td>204</td>
<td>NAssist</td>
</tr>
<tr>
<td>Barbering</td>
<td>605</td>
<td>BARB</td>
</tr>
<tr>
<td>Culinary Arts</td>
<td>630</td>
<td>CUL</td>
</tr>
<tr>
<td>Medical Secretary</td>
<td>743</td>
<td>MSec</td>
</tr>
<tr>
<td>Surgical Technology</td>
<td>1060</td>
<td>SurgTech</td>
</tr>
<tr>
<td>Cosmetology</td>
<td>1076</td>
<td>COS</td>
</tr>
<tr>
<td>Licensed Practical Nurse</td>
<td>1307</td>
<td>LPN</td>
</tr>
</tbody>
</table>

Research Participants

The sample for this study comprised CTE short-term program graduates from a post-secondary institution in Western New York. This sample of participants was a racially diverse student population who were 18 years of age and older. This population reported having a household income equal to, or less than, the poverty level, as determined by the New York State Department of Labor during their enrollment in the CTE programs. However, only students who self-report employment incomes after graduation were selected for this study.
The students included in this study must have completed a noncredit-bearing CTE short-term program in this institution, starting with the academic year of July 1, 2010 through June 30, 2015. Hence, the study analyzed CTE short-term program data sets from July 1 to June 30 for 2011, 2012, 2013, 2014, and 2015. The assumption was that a total sample of at least 800 CTE short-term program graduates was attainable from the 5-year span of self-reported income data from CTE short-term program graduates. However, even though 1,176 graduates reported their post-graduate income, only 490 of these graduates correspondingly reported their prior income before CTE short-term program enrollment. As a result, the population used in this study was 490 noncredit-bearing CTE short-term program graduates from this Western New York institution.

**Data Collection**

This study used secondary data sets from a post-secondary Western New York institution. The data set used was part of the information acquired from students during the admission and registration process, and it was stored in the BANNER Student Information System (BANNER® by Ellucian, n.d.). The BANNER system is an integrated software package system for maintaining higher education student data. Otherwise known as the Enterprise Resource Planning (ERP) system, the database was used, in part, to input and store student information, such as data on recruiting, admissions, advising, course scheduling, registration, finance, and grading, for this post-secondary Western New York institution.

The information was collected from BANNER by using the Argos reporting software. The Argos software transfers various data sets from BANNER, prompted by specific parameters that identify and meet the reporting needs from simple ad hoc
queries. In this case, student information with corresponding desired variable data was targeted (Evisions Blog, n.d.). These reports were downloaded to a Microsoft Excel spreadsheet to enable easy manipulation and to facilitate the removal of undesirable information, such as student-identifying information from the data set. Sample students’ data were stripped of any identifiers when the information was downloaded into Excel. Student names and ID numbers were deleted and replaced with placeholder numbers that were unrelated to the student ID numbers to maintain student confidentiality and anonymity.

The data were stored and protected by encryption in a universal serial bus (USB) flash drive used specifically for this purpose. The process of cleaning the data of any identifiers took the researcher less than 1 hour. The advantage of using the Excel spreadsheets was that all of the data could be seen in one place to help the researcher identify visible abnormalities in the data set for possible correction prior to use in the analysis in the Statistical Package for the Social Sciences (SPSS). SPSS is a software package used to perform data entry, manipulation, and statistical analysis, and it is capable of handling large amounts of data (Landau & Everitt, 2004).

**Procedures Used in Data Analysis**

This study examined the relationships of variables as they interact between employment income of CTE graduates from short-term programs, in relation to the students’ income before enrollment, length of the program, and demographic characteristics of the participants, to determine if there existed any relation between the variables. Huck (2012) contended that “The key concept of correlation requires that researchers look at the data . . . to see whether there is a relationship between the two sets
of scores, and how strong or weak that relationship is . . .” (Huck, 2012, p. 45). In this regard, the dependent variable, which is CTE graduate employment income (POSTINC), was observed in relation to multiple independent variables, such as income before enrollment (PREINC), length of program (PRGLENG), gender (GENDER), age (AGE), and race (RACE) in a multiple regression. The main reason a researcher uses multiple regression is for either prediction where there is a focus on the dependent variable or for an explanation where focus is on the independent variables (Huck, 2012). Table 3.2 shows the variables of interest identified for this study.

Table 3.2

<table>
<thead>
<tr>
<th>Variable Description</th>
<th>Variable Type</th>
<th>Measurement Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTINC</td>
<td>Dependent</td>
<td>Ratio Scale</td>
</tr>
<tr>
<td>PREINC</td>
<td>Independent</td>
<td>Ratio Scale</td>
</tr>
<tr>
<td>PRGLENG</td>
<td>Independent</td>
<td>Ratio Scale</td>
</tr>
<tr>
<td>AGE</td>
<td>Independent</td>
<td>Ratio Scale</td>
</tr>
<tr>
<td>GENDER</td>
<td>Independent</td>
<td>Nominal</td>
</tr>
<tr>
<td>RACE</td>
<td>Independent</td>
<td>Nominal</td>
</tr>
</tbody>
</table>

Note. POSTINC is the self-reported income of a CTE student graduate after obtaining employment; PREINC is the self-reported income of a CTE student before enrolling in a CTE program; and PRGLENG is the NY State required hours of instruction for a certificate or credential in each CTE program. AGE: students who attend CTE programs at the post-secondary level are 18 years and above; GENDER: male or female; RACE: ethnicity of the students.

To facilitate in performing the analysis for this study, all dollar amounts for employment income of students prior to admission, as well as post-graduation employment incomes, were adjusted to reflect uniformity by using the Consumer Price Index (CPI) to reflect cost-of-living adjustments in 2015 dollar values. This adjustment
was necessary because the value of money changes from year to year, and the study period was between 2011 and 2015. The basic premise of the time value of money, which is a fundamental financial principle, is that money gains value over time (Newton, 2008).

One of the ways that the dollar value can be adjusted to reflect future cost-of-living adjustments is by the use of the Consumer Price Index (CPI), which is a measure of inflation. The CPI is based on prices of food, clothing, shelter, fuels, transportation fares, charges for doctors’ and dentists’ services, drugs, and other goods and services that people buy during everyday living (U.S. Bureau of Labor Statistics [USBLS], 2015). This concept was further clarified by Schultze & Mackie (2002) who explained that “the Consumer Price Index (CPI) is one of the most widely used statistics in the United States. As a measure of inflation it is a key economic indicator . . . used to determine annual cost-of-living allowances for social security retirees” (Schultze & Mackie, 2002, p. 1). Schultze and Mackie’s (2002) claim is supported by Boskin, Dulberger, Gordon, Griliches, & Jorgenson (1998) who stated that the CPI impacts both the U.S. national budget as well as the national debt (Csipak & Zuccaro, 2014).

Because this research study considered students’ earning spanning 5 years, it was necessary to convert nominal dollars into constant or real dollars by multiplying each dollar amount by a ratio of price indexes (Perrins & Nilsen, n.d.), which are represented in Table 3.3. In other words, students who earned income in 2010 had these earnings valued at 2015 constant-dollar amounts by using the 2015 annual CPI, dividing this by the CPI in the year it was earned, and multiplying the result by the actual salary in the year the dollars were earned. The employment incomes before enrollment and post-graduation were measured in 2015 constant-dollar amounts to create homogeneity in the
incomes for comparison purposes. These calculations were performed in the Excel spreadsheet prior to uploading the data for analysis into the SPSS.

Table 3.3

*Average Annual Consumer Price Index Table (CPI)*

<table>
<thead>
<tr>
<th>Year</th>
<th>CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>214.54</td>
</tr>
<tr>
<td>2010</td>
<td>218.06</td>
</tr>
<tr>
<td>2011</td>
<td>224.94</td>
</tr>
<tr>
<td>2012</td>
<td>229.59</td>
</tr>
<tr>
<td>2013</td>
<td>232.96</td>
</tr>
<tr>
<td>2014</td>
<td>236.74</td>
</tr>
<tr>
<td>2015</td>
<td>236.27</td>
</tr>
</tbody>
</table>

*Note.* Source: U.S. Bureau of Labor Statistics. All items for all urban consumers for a U.S. city with the base years 1982-84 = 100.

The first research question asks if there is a significant relationship between post-graduation employment incomes and employment incomes before enrollment in short-term CTE programs for post-secondary CTE students in the Western New York area. The second research question asks if there is a significant relationship between post-graduation employment income and program length for CTE short-term programs graduates in the Western New York area. Both research questions were answered through computing a multiple regression with three variables. In this regard, the dependent variable, which is graduate employment income (POSTINC), was analyzed with the two independent variables, income before enrollment (PREINC) and length of program (PRGLENG). Applying a multiple regression analysis to this set of data resulted in
regression coefficients for each independent variable, which gave an estimated change in the dependent variable associated with a unit change in the corresponding independent variable (Landau & Everitt, 2004). The standardized regression equation for this regression took the form:

\[ \text{POSTINC}' = \beta_1 \text{PREINC}_{x_1} + \beta_2 \text{PRGLEN}_{x_2} + \cdots + \beta_n z_{x_n} \]

where POSTINC is the dependent variable (CTE graduate employment income), \( \beta_1 \) and \( \beta_2 \) are the regression coefficients for the independent variables PREINC (income before enrollment), and PRGLEN (length of program), respectively.

The third research question asks if there is a significant relationship between post-graduation employment incomes and the demographic composition of CTE short-term program graduates in the Western New York area. In this question, the dependent variable is post-graduation employment incomes, while the independent variables or factors include AGE, GENDER and RACE (demographic composition). These variables were categorical/nominal, grouped, and analyzed by the use of a one-way ANOVA, since this type of ANOVA focuses on group means (Huck, 2012). This study’s results generated standardized coefficients for the significant variables as shown below:

\[ \text{POSTINC}' = (0.11)\text{PREINC}_{x_1} + (0.11)\text{PRGLEN}_{x_2} + (0.14)\text{GENDER}_{x_3} + (0.11)\text{AGE}_{x_4} + \epsilon \]

**Summary**

In an effort to explore the associations between employment income of CTE graduates from short-term programs in relation to their income prior to enrollment, program length, and demographic characteristics, this chapter outlined the design of the research methodology. To facilitate the design of this study, the research questions guiding the study were considered, including a description of the research context and the
research participants involved. The data collection and data analysis process was also
described in this chapter. Chapter 4 reports on the collected and statistically analyzed
data, and it summarizes the findings.
Chapter 4: Results

The purpose of this study was to explore the association between the employment incomes of Western New York post-secondary graduates from short-term CTE programs and their incomes before enrollment, the length of the programs, and the demographic characteristics of the participants. This study is particularly important because very few studies or reports have focused on short-term CTE program certificates and their impact on labor market outcomes (Carnevale et al., 2012; Ewert, 2013; Sykes et al., 2014). This study, therefore, seeks to contribute to the growing body of knowledge in this area for the benefit of CTE practitioners and policy makers. This chapter summarizes the findings from the data collected, which was statistically analyzed and reported.

Research Questions

The results of this study address the student population demographics and the following three research questions:

1. Is there a significant relationship between post-graduation employment incomes and employment incomes before enrollment in short-term CTE programs for post-secondary CTE students in the Western New York area?
2. Is there a significant relationship between post-graduation employment incomes and program length for CTE short-term programs graduates in the Western New York area?
3. Is there a significant relationship between post-graduation employment incomes and the demographic composition of CTE short-term program graduates in the Western New York area?

The dependent variable (DV) used for all research questions is the post-graduation employment incomes. The independent variables (IVs) in the study are employment incomes before enrollment in a CTE program, program length, age, gender, and race of the students. To adequately respond to each of the research questions, the study used the Pearson correlation coefficient to establish the relationships between the IVs and the DV and an analysis of variance to compare and test between and within groups while testing the null hypothesis (H₀). A multiple regression analysis was used to explore the joint effects of the IVs upon the DV and also the individual influence of each of the variables on the dependent variable.

Both the employment incomes before enrollment and after graduation were measured in 2015 constant-dollar amounts to create homogeneity in the incomes for comparison purposes by using the consumer price index (CPI). The CPI is a measure of the average change in prices paid by a consumer for a fixed-market basket of goods and services, including food, at any given period (Csipak & Zucaro, 2014). For the analysis involving different time periods, it is necessary to convert the nominal dollars of the time periods into constant dollars, and this is done by multiplying each dollar amount by a ratio of price indexes (Perrins & Nilsen, n.d.). In this study, weekly incomes that were reported were annualized and measured in 2015 constant dollars. This chapter presents the results and analysis of this study in two sections. The first section discusses the
general population participation regarding frequencies, and the second part of the chapter responds to the research questions guided by an analysis of the results.

**Population demographics.** The study examined the student population demographics to determine the relationship between the CTE programs on the post-graduation employment incomes by those programs. The data used in this study examined students who self-reported graduate incomes after completing CTE short-term programs in 2011, 2012, 2013, 2014, and 2015. A total population size of 1,176 participants was identified as students who self-reported employment incomes after graduation, but of this total population, only 490 students self-reported their pre-enrollment income during registration for these short-term CTE programs. As a result, the population for this study included only students who reported complete data for all six variables. The total sample for the study was 490 students. This sample population was distributed over a 5-year period and is summarized in Table 4.1

Table 4.1 also includes the demographic characteristics of the participants in this study. The population studied consisted of 490 students with 399 females (84.1%) and 91 males (18.6%) who ranged in age from 18 to 85 years old. Students who fell within 26 to 35 years of age made up 46.1% of the total population. Figure 4.1 graphically represents the post-graduation and pre-enrollment mean income by age group. The ethnicity of the population was 14.3% Hispanic, 1.2% Asian, 69.4% African American, 0.2% Native American, 0.4% Pacific Islander, and 14.5% White. The mean employment incomes before enrollment of the participants in the study varied between $4,245 and $30,509 for all groups, and the mean employment incomes after graduation of the participants in the study also varied between $7,569 and $22,552 for all groups.
Table 4.1

Demographic Characteristics of Participants

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N</th>
<th>%</th>
<th>Mean PREINC $</th>
<th>Mean POSTINC $</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants by year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>57</td>
<td>11.6%</td>
<td>20,813</td>
<td>20,401</td>
</tr>
<tr>
<td>2012</td>
<td>176</td>
<td>35.9%</td>
<td>17,615</td>
<td>20,268</td>
</tr>
<tr>
<td>2013</td>
<td>116</td>
<td>23.7%</td>
<td>16,011</td>
<td>19,807</td>
</tr>
<tr>
<td>2014</td>
<td>67</td>
<td>13.7%</td>
<td>16,566</td>
<td>17,661</td>
</tr>
<tr>
<td>2015</td>
<td>74</td>
<td>15.1%</td>
<td>16,181</td>
<td>18,282</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>399</td>
<td>81.4%</td>
<td>16,911</td>
<td>18,963</td>
</tr>
<tr>
<td>Male</td>
<td>91</td>
<td>18.6%</td>
<td>18,724</td>
<td>21,949</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>122</td>
<td>24.9%</td>
<td>13,949</td>
<td>17,801</td>
</tr>
<tr>
<td>26-35</td>
<td>226</td>
<td>46.1%</td>
<td>16,673</td>
<td>19,753</td>
</tr>
<tr>
<td>36-45</td>
<td>73</td>
<td>14.9%</td>
<td>20,405</td>
<td>19,403</td>
</tr>
<tr>
<td>46-55</td>
<td>43</td>
<td>8.8%</td>
<td>22,430</td>
<td>22,552</td>
</tr>
<tr>
<td>56-85</td>
<td>26</td>
<td>5.3%</td>
<td>20,280</td>
<td>20,832</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>70</td>
<td>14.3%</td>
<td>16,464</td>
<td>18,909</td>
</tr>
<tr>
<td>Asian</td>
<td>6</td>
<td>1.2%</td>
<td>30,509</td>
<td>22,534</td>
</tr>
<tr>
<td>African American</td>
<td>340</td>
<td>69.4%</td>
<td>17,479</td>
<td>19,363</td>
</tr>
<tr>
<td>Native American</td>
<td>1</td>
<td>0.2%</td>
<td>4,245</td>
<td>13,382</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>2</td>
<td>0.4%</td>
<td>5,005</td>
<td>7,569</td>
</tr>
<tr>
<td>White</td>
<td>71</td>
<td>14.5%</td>
<td>16,316</td>
<td>21,027</td>
</tr>
</tbody>
</table>
Table 4.1 also shows that the mean employment incomes before enrollment and after graduation were higher for males than females. This gender income distribution is also graphically represented in Figure 4.2 and Figure 4.3. In the age category, the mean employment incomes before enrollment and after graduation for the 46-55 age group were the highest and for the 18-25 age group, they were the lowest. In the race category, the highest mean employment incomes before enrollment were among the Asian students, and the lowest mean employment incomes before enrollment were among the Native American students. The mean post-graduation employment incomes were also higher for the Asian students at $22,534, and they were lowest for the Pacific Islander at $7,569.

Figure 4.1. POSTINC mean distribution by AGE group (N = 490).
Figure 4.2. Female PREINC and POSTINC mean Income group (N = 399).

Figure 4.3. Male PREINC and POSTINC mean Income group (N = 91).
Table 4.2 presents the before-enrollment and post-graduation employment mean income of the 490 students by program participation rate. Of the CTE programs identified in this study, the participation rate was the highest for the licensed practical nursing program at 35.3%, and the lowest participation rate was found in the barbering program with a 2.7% participation. The mean income before enrollment of students in the CTE programs in the study varied between the lowest mean income of $11,760 (barbering) and highest mean income of $20,840 (licensed practical nurse). The post-graduation mean income of students in the CTE programs in the study varied between the lowest mean income of $15,498 (security guard program) and the highest mean income of $25,445 (barbering) for all CTE programs.

Table 4.2

<table>
<thead>
<tr>
<th>Program</th>
<th>HRS</th>
<th>N</th>
<th>%</th>
<th>Mean PREINC $</th>
<th>Mean POSTINC $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security Guard</td>
<td>24</td>
<td>28</td>
<td>5.7%</td>
<td>16,427</td>
<td>15,498</td>
</tr>
<tr>
<td>Medical Secretary Accelerated</td>
<td>120</td>
<td>17</td>
<td>3.5%</td>
<td>19,303</td>
<td>21,437</td>
</tr>
<tr>
<td>Home Health Care</td>
<td>128</td>
<td>34</td>
<td>6.9%</td>
<td>13,153</td>
<td>17,456</td>
</tr>
<tr>
<td>Pharmacy Technician</td>
<td>147</td>
<td>18</td>
<td>3.7%</td>
<td>18,051</td>
<td>17,137</td>
</tr>
<tr>
<td>Child Care Development</td>
<td>166</td>
<td>29</td>
<td>5.9%</td>
<td>15,476</td>
<td>18,347</td>
</tr>
<tr>
<td>Nursing Assistant</td>
<td>204</td>
<td>63</td>
<td>12.9%</td>
<td>15,135</td>
<td>18,666</td>
</tr>
<tr>
<td>Barbering</td>
<td>605</td>
<td>13</td>
<td>2.7%</td>
<td>11,760</td>
<td>25,445</td>
</tr>
<tr>
<td>Culinary Arts</td>
<td>630</td>
<td>22</td>
<td>4.5%</td>
<td>17,353</td>
<td>21,464</td>
</tr>
<tr>
<td>Medical Secretary</td>
<td>743</td>
<td>38</td>
<td>7.8%</td>
<td>14,810</td>
<td>20,811</td>
</tr>
<tr>
<td>Surgical Technology</td>
<td>1060</td>
<td>27</td>
<td>5.5%</td>
<td>16,518</td>
<td>23,074</td>
</tr>
<tr>
<td>Cosmetology</td>
<td>1076</td>
<td>28</td>
<td>5.7%</td>
<td>12,143</td>
<td>14,199</td>
</tr>
<tr>
<td>Licensed Practical Nurse</td>
<td>1307</td>
<td>173</td>
<td>35.3%</td>
<td>20,840</td>
<td>20,468</td>
</tr>
</tbody>
</table>

Note. N = 490
Another perspective of the relationship between post-graduation employment incomes and program length is represented in Figure 4.4, which presents a graphical illustration of post-graduate income earnings and participating short-term program lengths in hours. Of the 12 short-term programs included in this study, seven are in the healthcare industry with varying entry-level skills training from 120 hours through 1,307 hours. The three highest mean incomes for all reported post-graduation employment incomes with program length were in barbering (605 hours) with $25,445, the surgical technology program (1060 hours) with $23,074, and the culinary arts program (630 hours) with $21,464. Incidentally, these programs had low population representation of 2.7%, 5.5%, and 4.5%, respectively, as reported in Table 4.2 and graphically represented in Figure 4.5 and 4.6.

![Figure 4.4. POSTINC mean distribution by RACE group (N = 490).](image)
Figure 4.5. PREINC and POSTINC mean incomes by program.

Figure 4.6. Program Length in hours (PRGLENG).

Notes on programs: Barbering (BARB), Child Development Associates (CDA), Cosmetology (COS), Culinary arts (CUL), Home Health Aides (HHA), License Practical Nurse (LPN), Medical Secretary (MDSEC), Medical secretary accelerated program (MSECACC), Nursing Assistant (NASSIS), Pharmacy Tech (PHARMTECH), Security Guard (SECGUARD) and Surgical Technology (SURGTECH).
Table 4.3 presents the group income distribution by mean employment incomes before enrollment and post-graduation in 2015 dollar amounts. The researcher used the group income distribution because it is the best approach for reporting large income distributions in a table. The data showed that students who had low mean incomes before enrollment had relatively low mean incomes after graduation. For example, students earning below $10,000 before enrollment did not show any increase in their mean incomes after graduation from their programs. A suggested reason may be that some students in the group were mostly students who were on welfare and supported by state grants. It may be worthwhile to consider the challenges faced by this group to explore better strategies to help them become self-sustainable. On the other hand, students with a mean income of $23,592 showed relatively small increases in their mean income after graduation. Lastly, students who enrolled with high mean incomes of $46,474 showed a relatively high mean income of $57,907 after graduation.
Table 4.3

*Group Income Range Distribution by Mean (in 2015 Dollars)*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N</th>
<th>%</th>
<th>Mean PREINC $</th>
<th>N</th>
<th>%</th>
<th>Mean POSTINC $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below $10,000</td>
<td>141</td>
<td>28.78</td>
<td>7,416</td>
<td>52</td>
<td>10.61</td>
<td>6,880</td>
</tr>
<tr>
<td>$10,001-20,000</td>
<td>155</td>
<td>31.63</td>
<td>14,642</td>
<td>196</td>
<td>40.00</td>
<td>15,231</td>
</tr>
<tr>
<td>$20,001-30,000</td>
<td>148</td>
<td>30.20</td>
<td>23,592</td>
<td>205</td>
<td>41.84</td>
<td>23,886</td>
</tr>
<tr>
<td>$30,001-40,000</td>
<td>38</td>
<td>7.76</td>
<td>33,490</td>
<td>34</td>
<td>6.94</td>
<td>33,835</td>
</tr>
<tr>
<td>$40,001 and Above</td>
<td>8</td>
<td>1.63</td>
<td>46,474</td>
<td>3</td>
<td>0.61</td>
<td>57,907</td>
</tr>
</tbody>
</table>

*Note.* N = 490

Figure 4.7 shows the graphical representation of the frequency distribution of the employment incomes before enrollment and post-graduation (N = 490). The frequency distribution for those students who earned below $10,000 (28%), employment incomes before enrollment was reduced to 10.6% post-graduation employment incomes of the total N = 490 for post-graduation employment incomes. This implies that more than half of the students in this group saw an increase in their incomes after graduating from their programs. There was also a post-graduation employment income increase by 8.4% from employment incomes before enrollment to post-graduation employment incomes for students who earned between $10,001 and $20,000. Their peers, who earned between $20,001 and $30,000, also saw an 11.6% increase in income after graduating from the programs. The other groups did not show any substantial increase or decrease.
Figure 4.7. Population Distribution by Income Group (N = 490).

**Research question 1.** Is there a significant relationship between post-graduation employment incomes and employment incomes before enrollment in short-term CTE programs for post-secondary CTE students in the Western New York area?

For research question 1, the study first employed a Pearson correlation coefficient to determine the magnitude and direction of the relationship between employment incomes before enrollment (IV) and post-graduation employment incomes (DV). The Pearson’s r correlational procedure was used because it is the most frequently used bivariate correlational procedure designed to measure and produce raw scores that clarify differences among naturally occurring relationships among variables (Grimm & Yarnold, 2000; Huck, 2012).
Table 4.4 is a representation of a Pearson correlation matrix to determine if there is a significant relationship between employment incomes before enrollment and after graduation. In response to RQ1, the Pearson r showed a positive and statistically significant relationship between employment incomes before enrollment and post-graduation employment incomes with a correlation coefficient of .177, which is significant at $p < .01$.

To further articulate the between and within group variances of the employment incomes before enrollment and after graduation for research question 1, an analysis of variance (ANOVA) was used to determine the if there was a statistically significant mean difference between and within group variances. The fundamental task of the ANOVA is to identify the statistical significance of differences among groups of subjects (Grimm & Yarnold, 2000; Huck, 2012). A summary of the results of this analysis is presented in Table 4.5. The analysis used the Levene Statistic to test the homogeneity of variances between and within group means for post-graduation employment incomes and employment incomes before enrollment.

Furthermore, to control for Type I errors, a post hoc was explored using Games-Howell where equal variances were not assumed at $\alpha = .025$. The null hypothesis ($H_0$) was rejected showing that there was a statistical difference between and within the group means with $F (4, 485) = 6.77, p < .01$ ($N = 490$). This result further established a statistically significant relationship between post-graduation employment incomes and employment incomes before enrollment. The partial Eta squared ($\eta^2$) = .053 reported in Table 4.5 shows the strength of the association or the proportion of the total variance that is attributed to an effect on post-graduation employment incomes by the employment
incomes before enrollment variable. “Eta-Squared (ES) is often used as a measure of the strength of association of an effect, a measure often associated with effect size. It is also considered the proportion of total variance accounted for by an independent variable” (Barnette & McLean, 2000, p. 3). In other words, the value of $\eta^2 = .053$ in Table 4.4 for employment incomes before enrollment and after graduation indicates that 5.3% of the mean variance can be explained by the interaction for employment incomes before enrollment with post-graduation employment incomes for the tests of the between-subjects’ effects.

Table 4.4

*ANOVA for PREINC and POSTINC*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREINC*POSTINC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Grp</td>
<td>1637778544.14</td>
<td>4</td>
<td>409444636.04</td>
<td>6.77</td>
<td>.001</td>
<td>.053</td>
</tr>
<tr>
<td>Within Grp</td>
<td>29324554547.02</td>
<td>485</td>
<td>60462999.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30962333091.16</td>
<td>489</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* N = 490.

**Research question 2.** Is there a significant relationship between post-graduation employment incomes and program length for CTE short-term program graduates in the Western New York area?

To respond to research question 2, the study used the same procedure and tests used in research question 1 to arrive at the conclusion for the relationship between program length (IV) and post-graduation employment incomes (DV). As the same in
research question 1, a Pearson correlation coefficient was used to determine the magnitude and direction of the relationship between the IV and DV. The bivariate correlation showed a positive and statistically significant relationship between program length and post-graduation employment incomes with a Pearson r coefficient of .118 that is significant at $p < .01$, which can be seen on Table 4.11. This report shows a statistically significant relationship between post-graduation employment incomes and program length. To explore the between and within group variances of the program length and post-graduation employment incomes for research question 2, the study used an ANOVA to determine: (a) between and within group variances, and (b) to see if there was a statistically significant difference in their mean difference.

A summary of the results of this analysis is presented in Table 4.5. The Levene Statistic, which is a test for the homogeneity of variances between and within group means for post-graduation employment incomes and program length, was employed. To control for Type I errors, a post hoc was explored using Games-Howell where equal variances were not assumed at $\alpha = .025$. $H_0$ was rejected showing that there was a statistical difference between and within the group means with $N = 490$ that resulted in a statistically significant result, where $F (11, 478) = 4.22, p < .01$. The Eta squared, which is the measure of association ($\eta^2$) = .088, shows the proportion of the total variance that is attributed to the effect by the program length variable on the post-graduation employment income variable. For example, the value of $\eta^2 = .088$ indicates that 8.8% of the mean variance can be explained by the interaction for program length with post-graduation employment incomes.
Table 4.5

ANOVA for PREINC and POSTINC

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>(η²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRGLEN*POSTINC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Grp</td>
<td>2740026602.9</td>
<td>11</td>
<td>249093327.5</td>
<td>4.22</td>
<td>.001</td>
<td>.088</td>
</tr>
<tr>
<td>Within Grp</td>
<td>28222306488.2</td>
<td>478</td>
<td>59042482.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30962333091.2</td>
<td>489</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Research question 3. Is there a significant relationship between post-graduation employment incomes and the demographic composition of CTE short-term program graduates in the Western New York area?

To respond to research question 3, a Pearson correlation coefficient was used to determine the magnitude and direction of the relationship between the post-graduation employment incomes and demographic composition. The bivariate correlation showed a positive and statistically significant relationship between age and post-graduation employment incomes with a Pearson r coefficient of .158, which is significant at \( p < .01 \). Also, the bivariate correlation showed a positive and statistically significant relationship between gender and post-graduation employment incomes with a Pearson r coefficient of .146, which is significant at \( p < .01 \).

To further explore the between and within group variances of the age, gender, race, and post-graduation employment incomes for research question 3, the study used an
ANOVA to determine the between and within group variances to see if there was a statistically significant difference in their mean differences. A summary of the results of this analysis is presented in Tables 4.6, 4.7, and 4.8 for which the procedure and outcomes are reported. Table 4.6 shows a significant relationship between age and post-graduation employment income with \( p = .012 \). Table 4.7 shows a significant association between gender and post-graduation employment incomes with \( p < .01 \). Table 4.8 shows a non-significant association between race and post-graduation employment income with \( p = .106 \).

Table 4.6

*ANOVA for AGE and POSTINC*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>( \eta^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE*POSTINC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Grp</td>
<td>813610374.87</td>
<td>4</td>
<td>203402593.72</td>
<td>3.27</td>
<td>.012</td>
<td>.026</td>
</tr>
<tr>
<td>Within Grp</td>
<td>30148722716.29</td>
<td>485</td>
<td>62162314.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30962333091.16</td>
<td>489</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* N = 490.
Table 4.7

*ANOVA for GENDER and POSTINC*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>(η²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER*POSTINC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Grp</td>
<td>660292459.35</td>
<td>1</td>
<td>660292459.35</td>
<td>10.63</td>
<td>.001</td>
<td>.021</td>
</tr>
<tr>
<td>Within Grp</td>
<td>30302040631.82</td>
<td>488</td>
<td>62094345.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30962333091.16</td>
<td>489</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* N = 490.

Table 4.8

*ANOVA for RACE and POSTINC*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>(η²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RACE*POSTINC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Grp</td>
<td>573545221.21</td>
<td>5</td>
<td>114709044.24</td>
<td>1.83</td>
<td>.106</td>
<td>.019</td>
</tr>
<tr>
<td>Within Grp</td>
<td>30388787869.95</td>
<td>484</td>
<td>62786751.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30962333091.16</td>
<td>489</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* N = 490.

To control for Type I errors, a post hoc was explored using Games-Howell where equal variances and group sizes were not assumed at α = .025. H₀ was rejected for age;
gender showing that there was a statistical difference between and within the group means, which resulted in a statistically significant result for age and gender with the omnibus F statistic for $F(4, 485) = 3.27, p = .012$ and $F(1, 488) = 10.63, p < .01$.

The Eta squared, which is the measure of association ($\eta^2$) = .026 (age), and .021 (gender) shows the various associations or the proportion of the total variance that is attributed to an effect between the age/gender variable and the post-graduation employment incomes variable. For example, the value of $\eta^2 = .026$ indicates that 2.6% of the variance can be explained by the interaction of age with post-graduation employment income.

However, the null hypothesis was not rejected in the case of race, which resulted in a non-statistically significant result with $F(5, 484) = 1.83, p = .106$. As reported in Table 4.8. This infers that the proportion of the total variance that is attributed to an effect between the race group variable and the post-graduation employment incomes variable is not significant. It is noteworthy that the bivariate correlation was not used for race because it did not show a positive and statistically significant relationship between race and post-graduation employment incomes in the analysis of variance.

To further analyze the joint influence of the independent variables and individual influence of each of the variables on the dependent variable, this study used a multiple regression analysis to determine the relative weights of each variable. Huck (2012) explained that while bivariate correlation is designed to illuminate the relationship by focusing on the sample correlation coefficient, multiple regression, amongst other purposes, inclusively shows the change in the regression coefficient for joint effects of the independent variables (Huck, 2012).
As reported in Table 4.9, the results revealed that there was a statistically significant relationship between post-graduation employment incomes and the following variables regarding contribution to the model: employment incomes before enrollment, gender, age, and program length. A stepwise regression analysis was first performed to select entry into the predictive model by systematically excluding the independent variables with limited influence or contribution to post-graduation employment incomes in the model. This model showed a combination of the dependent variable and predictors in the regression by displaying the relationship between post-employment and employment incomes before enrollment, gender, age, and program length (HRS), which gives an F (4, 485) = 9.39 at \( p < .01 \). The model also showed a combined significant relationship between the post-employment income and the four independent variables, which included: employment incomes before enrollment, gender, age and program length (HRS).

Table 4.9

ANOVA Results for POSTINC<sup>a</sup>

<table>
<thead>
<tr>
<th>Model</th>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Std. Mean Squares</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Regression</td>
<td>2,227,074,900.05</td>
<td>4</td>
<td>556,768,725.01</td>
<td>9.39</td>
<td>.001&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>28,735,258,191.12</td>
<td>485</td>
<td>59,247,955.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30,962,333,091.16</td>
<td>489</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* N = 490. <sup>a</sup>Dependent variable: POSTINC, <sup>b</sup>Predictors: (Constant), PREINC, GENDER, AGE, PRGLENG (HRS). <sup>c</sup>(Model) explains the combination of <sup>a</sup>Dependent variable and <sup>b</sup>Predictors in the regression.
Table 4.10 illustrates the regression coefficients in the model. Model shows the standardized beta weights of employment incomes before enrollment at .11 ($p = .014$), gender at .14 ($p < .01$), age at .12 ($p = .010$), and program length at .11 ($p = .018$). This infers that gender has the highest impact on this combination model (beta = .14) followed by age (beta = .12), the employment incomes before enrollment and program length (beta = .11) in its contribution to the model.

Table 4.10

*Regression Coefficients for POSTINC*

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>10,172.46</td>
<td>1,650.00</td>
<td>6.17</td>
<td>.001</td>
</tr>
<tr>
<td>PREINC</td>
<td>0.10</td>
<td>0.04</td>
<td>0.11</td>
<td>2.46</td>
</tr>
<tr>
<td>GENDER</td>
<td>2,895.64</td>
<td>906.14</td>
<td>0.14</td>
<td>3.20</td>
</tr>
<tr>
<td>AGE</td>
<td>90.70</td>
<td>35.09</td>
<td>0.12</td>
<td>2.58</td>
</tr>
<tr>
<td>PRGLENG (HRS)</td>
<td>1.66</td>
<td>0.70</td>
<td>0.11</td>
<td>2.38</td>
</tr>
</tbody>
</table>

*Note.* $N = 490$; *Predictors: (Constant), employment incomes before enrollment, gender, age, program length (HRS); *Dependent variable: POST INC
Table 4.11

*Pearson Correlation Matrix for Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>POSTINC</th>
<th>PREINC</th>
<th>PRGLENG (HRS)</th>
<th>AGE</th>
<th>GENDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTINC</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PREINC</td>
<td>.177**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRGLENG(HRS)</td>
<td>.118**</td>
<td>.209**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>.158**</td>
<td>.251**</td>
<td>.024</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GENDER</td>
<td>.146**</td>
<td>.077</td>
<td>-.115*</td>
<td>.068</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note.* N = 490; **Correlation is significant at the 0.01 level (two-tailed).

**Summary of Results**

This chapter reported the findings of the statistical analysis of demographic data and the three research questions presented. The results show that there is a significant relationship between post-graduation employment incomes and employment incomes before enrollment of short-term CTE programs for post-secondary students in the Western New York area. The results also confirm a significant relationship between post-graduation employment incomes and program length in short-term CTE programs for post-secondary students in Western New York.

However, while the results show that there is a significant relationship between post-graduation employment incomes and some demographic characteristics, such as age and gender, the study did not find a statistically significant relationship for post-graduation employment incomes and race for short-term CTE program post-secondary students in the Western New York area. The study further discusses these findings and
summarizes the entire study in Chapter 5, where recommendations for further research as well as the study’s limitations are discussed including implications for action.
Chapter 5: Discussion

Introduction

The purpose of this study was to explore the differences between the employment incomes of Western New York post-secondary graduates from short-term, noncredit-bearing CTE programs and their incomes before enrollment, the length of the programs, and the demographic characteristics, such as gender, age, and race, of the study group. It is essential to note that credential attainments, including significant job-related licenses and/or industry-recognized certifications, are key outcomes for CTE programs (Rosenbaum et al., 2013).

Ewert (2013) claimed that there was a dearth of relevant data that comprehensively captured information about these alternative credentials options with the view that very few studies or reports focus on these short-term certificates (Ewert, 2013). Furthermore, if consideration is given to the notion that there has been a national increase in awards for certificates, generally, and short-term certificates, in particular (Carnevale et al., 2012; Ewert, 2013; Sykes et al., 2014), it was therefore worthwhile to explore the relationship between prior- and post-employment incomes of CTE graduates from short-term CTE programs. The variables considered in this study represent some factors that influence the employment incomes for CTE short-term, noncredit-bearing post-secondary CTE graduates.

This quantitative study revealed that there were significant positive associations between post-graduate employment incomes and incomes before enrollment, and post-
graduate employment income and length of the program. However, results from the study of the relationship between post-graduate employment income and demographic characteristics (i.e., gender, age, and race) indicated that only gender and age showed a statistically significant positive relationship with post-graduate employment income. There was no statistically significant relationship between post-graduate employment income and race. This chapter is organized under five major headings, which include: (a) Introduction, (b) Implications of Findings, (c) Limitations, (d) Recommendations; and (e) Conclusion. This chapter discusses the findings from the following three research questions of the study:

1. Is there a significant relationship between post-graduation employment incomes and employment incomes before enrollment in short-term CTE programs for post-secondary CTE students in the Western New York area?
2. Is there a significant relationship between post-graduation employment incomes and program length for CTE short-term program graduates in the Western New York area?
3. Is there a significant relationship between post-graduation employment incomes and the demographic composition of CTE short-term program graduates in the Western New York area?

Implications of Findings

This study has generated a number of implications that would be of interest to policy makers, career and technical education practitioners, and noncredit-bearing program educators in post-secondary education. According to the Association for Career and Technical Education (2010), skills acquisition is the most important aspect of
acquiring an education. The main idea behind post-secondary, noncredit-bearing CTE short-term programs is to train students for new skills that are emerging and provide in-demand, entry-level job opportunities.

**Scholarship/research implication.** Based on the results of this study, a statistically significant relationship was found between CTE students’ post-graduate employment incomes and their incomes before enrollment. These results infer that there was an average increase in income for students who enrolled in post-secondary, noncredit-bearing short-term CTE certificate programs in this sample population. Scholars interested in sub-baccalaureate degree earnings posited that certificates see relative increases in earnings for those who received them (Dadgar & Weiss, 2012; Grubb, 1995, 1997, 1999). This study is consistent with their findings to the extent that post-graduate employment incomes and incomes before enrollment have a statistically significant relationship. In addition, the results also infer that students who engage in these noncredit-bearing, short-term CTE certificate programs see improved income levels from incomes before enrollment to post-graduate employment incomes. Therefore, short-term, noncredit-bearing certificate training programs can be seen as accelerated programs along career pathways that are designed to efficiently and quickly return individuals to the workforce (ACTE, 2010; Van Noy & Jacobs, 2009; Van Noy, Jacobs, Korey, Bailey, & Hughes, 2008).

Carnevale, Rose et al. (2012) claimed that while there is an association between some program length and earnings, other programs do not show the same associations; thus concluding that the association between program length and earnings was not clear. Furthermore, they contended that the differences in program length can be attributed to
the fact that different programs require different time lengths to study efficiently and learn these desired skills (Carnevale, Rose et al., 2012). However, some individuals may be tempted to assume wrongly that the more time that is needed to learn a skill, the higher the economic reward (Carnevale, Rose et al., 2012). In the same vein, based on the results and findings in this study, four allied health programs saw increases in income before enrollment and after graduation. The medical secretary, surgical technology, home health aide, and certified nursing assistant programs all had higher increases in income than the other programs. It must also be noted that these increases were not proportionate to the time spent in the program.

Based on the results of this study, a statistically significant relationship was found between CTE students’ post-graduate employment incomes and age. In the age category, there was a higher participation rate for individuals whose ages fell between 26 to 35 years than in other groups. From the researcher’s perspective, a logical reason for the higher participation rate for older adults over other groups in this study might be attributed to the possibility that many older adults return to school to improve their skills and to cope with the technical aspect of today’s jobs that require additional specialized skills training. Without this educational training, these adults could run the risk of losing their jobs and become unemployed or they could be passed over for a promotion (USDOL, 2013). The difference in mean incomes between age groups can also be attributed to the fact that older students who are already active in the labor market are returning to school to seek higher credentials in order to enhance their earning potential.

The results of this study show that females earn less than men after graduating from the CTE programs and acquiring entry-level jobs. The idea that there is an income
disparity between the genders, with females earning less than males in this study, corroborates another result from a Pew Research Center report in 2013, entitled, *The Pay Gap, Millennial Women Near Parity –For Now Despite Gains, Many See Roadblocks Ahead*, which reported that, “In 2012, among workers ages 25 to 34, women’s hourly earnings were 93% those of men. By comparison, among all working men and women ages 16 and older, women’s hourly wages were 84% those of men” (Pew Research Center, 2013, p. 1). In addition, this study also revealed that 81% of this population sample were female, and 19% were male. However, this could either imply that more males were not interested in these entry-level jobs or that females are more likely to self-report their employment incomes after graduation. The high female population corroborates the findings of Marcotte (2010) who found that of those enrolling in community colleges and earning either a certificate or degree were mostly women.

In the race category, the African American student population showed the highest participation rate with 69% when compared with other ethnic groups in the study. As observed in the Western New York population demographic data, one of the major reasons for the high participation rate among African Americans in the CTE programs identified in this study could be the high unemployment rate among African Americans when compared to other ethnic groups in 2010 (McDermott & Daneman, 2013).

**Theoretical implication.** The theoretical framework for this study is based on signaling theory. Spence’s (1973) work on labor markets demonstrated that job applicants engage in behaviors that reduce information asymmetry to facilitate the selection ability of prospective employers (Connelly et al., 2011; Spence, 1973). Given that individual applicant’s productive capabilities are not easy to determine prior to hiring, employers
read credential attainment as signals to predict productivity, resulting in a job or a salary offer (Connelly et al., 2011; Spence, 1973; Tan, 2014). In this study, therefore, the focus was to explore whether the signals of the credentials reduce information asymmetry between the employer and the CTE certificate program graduate, resulting in better post-graduation employment incomes. The results of this study found statistically significant relationships between the post-graduation employment income and the pre-enrollment income, length of program, gender, and age, but the same was not true of race.

Moore, Jez, Chisholm, & Shulock, (2012) corroborated with this study by articulating that skills acquired from post-secondary, noncredit-bearing short-term CTE certificate programs would translate into employment and, consequently, better paying wages. This argument is in alignment with the view that individual applicant’s productive capabilities from skills acquired in post-secondary, noncredit-bearing short-term CTE certificate programs signal employers to hire graduates, thus resulting in a job offer. However, for such short-term certificates to better serve graduates in the long run, program offerings must adapt to changing labor market needs while simultaneously developing efficient pathways from entry-level transition credentials into advanced credential levels (Moore et al., 2012). Such adjustments are possible because where there are collaborations with employers, resource allocation and/or reallocation for CTE programs can be predicted (Moore et al., 2012). This is because changes in post-secondary, noncredit-bearing short-term CTE certificate programs have been shown to be positively related to the needs of the employers and the labor market as a whole (Moore et al., 2012)
Some researchers contend that post-secondary, noncredit-bearing short-term CTE certificate are aptly suited for nontraditional students in the workforce. Carnevale, Rose et al. (2012) explained this by saying that, “At a time when 36 million American workers who attended college and did not complete a degree, certificates are piecemeal, attainable, bite-sized educational awards that can add substantially to post-secondary completion” (Carnevale, Rose et al., 2012, p. 2). While this statement alludes to the number of non-degree holders in the workforce, it also infers the need to upgrade and upskill these employees. Therefore, programs offered for credentials must have a market value for students and validated by post-graduate employment data (Moore et al., 2012).

Based on the results of this study, allied health programs, such as the medical secretary program, the surgical technology program, the home health aide program, and the certified nursing assistant program, saw increases in income after graduation. It can therefore be inferred that these programs’ certificates are in demand, thus reducing information asymmetry between the program graduates and employers. This idea is consistent with the claim that noncredit-bearing, short-term CTE certificate programs also create an opportunity for individuals to reskill themselves in emerging jobs that are in demand (Carnevale, Jayasundera, & Hanson, 2012; Carnevale, Rose et al., 2012). For example, a student interested in the allied health programs may begin with a short-term certificate as a home health aide and move on to another level as a certified nursing assistant and, after completion, enroll into a licensed practical nurse program. This upward career movement identifies a career pathway. In this example, all of these levels of entry into the workforce could accommodate secondary level education.
**Practical implication.** While contributing to the body of knowledge, this study aligns with the notion that noncredit-bearing CTE program graduates from economically disadvantaged backgrounds do show statistically significant employment income increases from their pre-enrollment incomes after participating in some post-secondary, short-term CTE programs in the Western New York area.

On the other hand, Stokes, (2002) defines the workforce development system as a “web of organizations, institutions, agencies, and businesses that identify, recruit, place, and retain people in jobs who face barriers to employment.” (Stokes, 2002, p. 6). Lack of opportunity for education and skills acquisition may cause barriers to employment due to low basic skills. Therefore, workforce development system stakeholders may therefore consider addressing barriers to employment by providing strong employment program foundation that include CTE programs. This is especially important because the cost to the economy as a result of unemployment and welfare receipts is greater than its benefit when these opportunities are not created.

The results from this study indicate that the completion of some short-term CTE programs can improve the financial earnings of those that choose to participate in this type of educational training. The implication for policy makers and career and technical education practitioners is to harness results from this with other best practices to encourage increased participation in CTE for and economically disadvantaged populations. The more individuals with low incomes can participate in CTE program the more opportunities they could have to help jumpstart their career pathways.
Limitations

This study had a limitation that resulted from the nature of the data set used. It was pre-collected data from a sample population that was specifically made up of economically disadvantaged participants who were recruited into short-term, post-secondary CTE programs with no data on their family sizes. Moreover, the information collected was limited to students who self-reported their post-graduation incomes. A total of 1,176 students reported their post-graduation incomes, yet only 490 reported their pre-enrollment incomes. As a result, there was limited sample data, which further impacted the non-generalizability of this study. Hence, the results may not be representative of all students participating in post-secondary, noncredit-bearing short-term CTE programs in the Western New York area.

Another limitation was that the self-reported graduate incomes were projected into annualized incomes for all students in the study. This was necessary because the verifiable self-reported income data that were collected from weekly earnings required a common base for comparison. This is a limitation because the study used estimated income data, which was generated by an annualized income formula.

Recommendations

Results from this study revealed that post-graduation incomes of the participants were significantly associated with before-enrollment incomes, program length, age and gender for short-term CTE programs graduates. Consequently, the researcher identified several recommendations in the area of public policy, future research, and professional practice.
Public policy. Overall, this study has shown that noncredit-bearing, short-term CTE programs are beneficial to the economically disadvantaged students targeted in this study. Therefore, since the funding for these students comes from the federal government, U.S. Congress should appropriate more funds to support the continued offering of CTE programs, because public policy plays a significant role in CTE training programs. The most recent report from the Government Accountability Office stated that only 34 federal programs were providing occupational or vocational training as a primary service through national systems such as CTE programs administered by the USDOE (Dortch, 2014). However, following the 2008 recession, the high unemployment rate and an increased technological-based economy created a need for skills upgrading, so there is a critical need to support the funding of these training programs (Carnevale et al., 2010). It is hopeful that Congress has highlighted the need to effectively support workforce development in order to reduce unemployment and the associated economic and social issues (Dortch, 2014). In this light, more workforce-development training programs should be supported by Congress and the states.

New York State should appropriate enough funding to support the implementation of career pathways as part of their workforce-development strategy. The strategy should include both post-secondary credit-bearing and noncredit-bearing institution programs in the workforce education system. In this case, a seamless transition can be made to connect short-term training program certificates or credentials for disadvantaged post-secondary student graduates such that employers can employ them after completion. In other words, these noncredit-bearing, sub-baccalaureate short-term certificate training programs would serve New York State better because these programs are accelerated and
designed to efficiently and quickly return individuals to the workforce (ACTE, 2010; Van Noy & Jacobs, 2009). An important element to note is that in serving employers, research shows that post-secondary, noncredit-bearing workforce education institutions usually develop a range of programs that reflect the local labor market needs. These program offerings are often driven by need from local employers and serve both the state and labor market demands (Van Noy et al., 2008).

Practitioners for public policy, along with advocacy groups, should use this study, along with other best practices, to highlight the contributions that can be made by participating in CTE to the community and engage local political and community leaders to use the available tools to create incentives for prospective students and employers (stake holders). For example, some tools could include the use of grants that encourage employers to hire CTE students. Furthermore, these grant incentives could also be made available to post-secondary, noncredit-bearing institutions for the under-served population to act as incentives for student retention purposes.

Procedural recommendations. Emerging jobs that are in demand, such as entry level jobs in the allied health industry, including home health aide, nursing assistants and license practical nursing, require new “add-ons” to existing program curriculum, which in turn, creates various career pathways in the health sector (Moore et al., 2012). To effectively maximize these opportunities, multiple career pathways for students need to be identified and explained to potential students of CTE post-secondary, noncredit-bearing programs during the admission process to help these students identify career choices that are in demand or can lead to a satisfactory career launch.
CTE short-term certificates, which signal skill acquisition to employers, do encourage the entry-level jobs that facilitate career pathways for the economically disadvantaged population. To help CTE post-secondary, noncredit-bearing programs students make better choices in determining which credential better suites the students’ need, CTE programs admission counselors should inform students of the potential of obtaining credentials, incrementally, for employment or advanced studies if they so choose. The possibility of a career pathway that builds on noncredit-bearing CTE short-term certificate improvement, through further education in colleges and universities, should be encouraged by these institutions.

However, such program collaboration illuminates the idea of developing articulation agreements between post-secondary education CTE short-term programs, employers, and credit- and noncredit-bearing institutions. Collaboration between all stakeholders ensures that employers’ signals are reflected in all curriculums, as credit-bearing and noncredit-bearing post-secondary programs reflect the same signals. Van Noy et al. (2008) stated that the articulation process is the best means whereby institutions enable students to receive credit for completing a noncredit-bearing course if they later choose to enroll in a credit-bearing courses. These noncredit-bearing courses validate the attainment of skill sets in a profession, and they are considered as skill sets for relevant building blocks toward career pathways that go beyond sub-baccalaureate degree attainment (Van Noy et al., 2008).

The challenge, however, is for practitioners and the leadership of post-secondary, noncredit-bearing short-term CTE certificate programs to connect with the stakeholders (i.e., students, post-secondary education administrators, and employers), synthesize and
use research knowledge to inform of changes in programs with low signals to employers so that institutions could offer more programs that have high signaling abilities, like the allied health programs. Offering more post-secondary CTE noncredit-bearing short-term programs with high signaling abilities for employers could increase employment opportunities for CTE program graduates.

CTE practitioners should organize early interventions in student choices. Such interventions could take the form of career advisers and counselors meeting one on one with students. These meetings could help the students better understand the career pathway choices available to them for CTE noncredit-bearing short-term certificates. These early interventions would help students identify with their likes and dislikes and avoid situations where they may engage in careers that may later not be fulfilling to the student’s interest.

**Future research.** Future studies on CTE might consider including more population samples from other CTE noncredit-bearing certificate providers such as community colleges, private and public colleges, and universities. The reason for this recommendation is that the need for post-secondary, noncredit-bearing education has become increasingly “common, as many community colleges, have enrolled more students than credit-bearing programs do” (Van Noy & Jacobs, 2009, p. 87). The growth in noncredit-bearing programs is directly linked to workforce education instruction, which supports the claim that these programs play a significant role in responding to shifting workforce demands by responding to employer needs (Van Noy & Jacobs, 2009).

Future studies on CTE noncredit-bearing, short-term certificate programs could focus on economically disadvantaged populations, at the state and national levels, to
broaden the scope of the results in this study. A better understanding of CTE noncredit-bearing certificate training programs may enable CTE practitioners to create a stronger link between CTE noncredit-bearing certificate training programs and credit-bearing programs at other post-secondary institutions. This increased knowledge for CTE practitioners could reduce course duplication and ensure the continuity of individuals toward career pathways that are more economically self-sustaining. More information could also facilitate the development of articulation agreements between all post-secondary institutions offering CTE noncredit-bearing programs and reduce education costs for students.

Future studies could employ qualitative or mixed-methods inquiry. These studies could focus on exploring students’ experiences with more variables associated with post-graduation income of CTE graduates. An example of this type of study would be to investigate the relationship between socio-economic status (SES) and post-graduation employment incomes of students in noncredit-bearing CTE short-term programs. Another example of a future study worth considering is whether post-graduation employment incomes of noncredit-bearing CTE short-term certificate students vary significantly with students who do not gain employment in the program training area for which the credential is attained. This leads to the question why some post-secondary CTE short-term certificate programs from which students graduate remain in the below $10,000 annual income group. For example, this study reported that a population of 141 (N = 141) students reported pre-enrollment incomes below $10,000 with a mean income of $7,416. However, at post-graduation, even though the population in this group dropped to 54 (N = 54), the mean income was lower at $6,880. Future research may explore this category
to study any challenges affecting this group in economically disadvantaged populations with post graduate CTE certificate holders.

Finally, this study did not take into account all of the variables that can influence post-graduation employment incomes of short-term CTE program graduates. Rather, this study was seeking specific associations or relationships between post-graduation incomes with pre-enrollment incomes, program length, age, gender, and race. Thus, future studies could explore other influencing factors, such as information on student assessment scores and academic performance academic, in conjunction with motivational influences of economically disadvantaged individuals.

Professional practice. Based on the results of this current study, graduates from the allied health programs saw increased post-graduation incomes. This implies that employers are comfortable with the skills acquired through these CTE short-term training programs. To increase employment opportunities for CTE program graduates, employers should have a stake in creating the programs for training workers who can fill these roles. Consequently, if post-secondary education administrators create CTE programs in collaboration with employers and their needs, this would ensure that students could obtain employment and be equipped with workforce skills for the 21st century with an opportunity of securing better wages (Feller, 2003). The central objective of post-secondary, noncredit-bearing short-term CTE certificate programs must always be to create career pathways for individuals that lead to credentialing and, ultimately, employment and economic security.

Leaders in post-secondary, noncredit-bearing short-term CTE certificate programs should have an integrated approach that encourages inquiry into a range of significant
issues in order to develop creativity while focusing on asking the right questions, that effectively deal with community needs regarding workforce development (Bolman & Deal, 2013). For example, concerning gender inequality of income arising from admission choices, Carnevale, Rose et al. (2012) reported that: “The gender gap exists partly because men and women enter different fields of study, which have varied earning return. Of the 14 different certificate fields identified, 12 are extremely sex-segregated” (Carnevale, Rose et al., 2012, p. 9). This study corroborates these findings, consequently raising questions for investigation. Leadership in post-secondary, noncredit-bearing short-term CTE certificate programs needs to take a critical look at this gender disparity in income and tailor admission policies such that admission counselling, as well as admission requirements, address this issue to ensure that gender bias does not exist.

Increased participation in rigorous short-term programs with in-demand jobs could be explored in combination with articulation agreements. Post-secondary institutions and employers may be consulted to find ways that encourage efficient and less costly pathways to higher professional certificate levels for students who are not absorbed by the labor market. Some admission processes in credit bearing institutions for some CTE certificate attainment in both 2-year colleges as well as 4-year institutions place restrictions, such as remedial courses that are not skill specific for CTE students. These remedial courses are paid for by students either through school loans or grants which place increased financial burdens and time on students entering post-secondary institutions. This policy could be re-examined to determine if other methods could be used to facilitate a smooth transition of economically disadvantaged CTE students to those institutions. For example, entry assessment tests could be tailored to specific skill
requirements for CTE students to ensure that students take only courses relevant to their career of choice.

**Conclusion**

The purpose of this study was to explore the association between the employment incomes of Western New York post-secondary graduates from noncredit-bearing short-term CTE programs and their incomes before enrollment, the length of the programs, and the demographic characteristics of the participants. The results of this study revealed that there were statistically significant relationships between the employment incomes of post-secondary graduates from noncredit-bearing short-term CTE programs and their incomes before enrollment, the length of the programs, and the age and gender of the participants. There was no statistically significant relationship between post-graduation employment incomes and race. Similar results were found from studies completed on short-term CTE programs in community colleges (Marcotte, 2010).

The major conclusion to draw from these results is that there is a connection between post-graduation employment incomes and incomes before enrollment, the length of the programs, and the age and gender of the participants. However, it must be pointed out that even though there is a positive statistical relationship between pre-enrollment incomes and post-graduation incomes for entry-level in-demand jobs, this is not an end unto itself. There is a need for policy makers and CTE practitioners to articulate professional and skill-building pathways with stackable credentials that could be nationally accepted by universities in order to recognize noncredit-bearing short-term CTE program certificates on their merits toward baccalaureate degrees. Stackable credentials mean that individual credential achievement can be accumulated over time to
build up an individual’s qualifications to help them move up a career pathway to different and potentially higher-paying jobs (Oates, 2010).

The importance of CTE short-term training certificates lies in the fact that they validate the program graduate’s skill and ability to produce in a specific CTE program area, thus signaling employers for potential higher earnings. Based on the signaling theory, this study found evidence to the claim that short-term CTE program graduates’ incomes have different signals from pre-enrollment income signals as evident in the increased earnings. CTE programs that are sub-baccalaureate in nature provide individuals with the opportunity to upgrade and develop skills in a fast-paced, rigorous academic, and technical educational environment (Van Noy et al., 2008).

Most certificates are typically classified by program length, which has led some policy makers and practitioners to think of course length as an expected way to classify certificates’ economic value (Carnevale, Rose et al., 2012). This claim is misleading, because, from the results of this study, even though the length of the program had a statistically significant relationship to post-graduation incomes, this relationship was not clear because some programs with more contact hours did not yield higher post-graduation incomes relative to the time spent for the post-secondary, noncredit-bearing CTE certificates.

In an increasing technological based economy, the 2008 Great Recession accelerated the shift to jobs requiring CTE post-secondary education skills training, signaling the need for increased training in emerging in-demand jobs (Carnevale et al., 2010). Another argument for CTE post-secondary education skills training is that there is a skills gap in the economy for workers (Abraham, 2015; Kahn, 2015). The lack of
employee skills means that employers cannot get the best workers for the emerging jobs in the new information- and/or technology-driven economy (Cappelli, 2015). The motivation for employees to acquire a new skill may arise from layoffs from a particular job, the need to upgrade existing skills in a given field, or simply the individual may need a job. Whatever the reasons, the most important aspect for acquiring a CTE short-term certificate is employment (Rosenbaum, 2001). This study used pre-enrollment and post-graduation incomes of students after CTE noncredit-bearing, short-term program certification to determine if these certificates for employment emit different signals to employers for employment and higher wages.

The literature on short-term program certificates shows there was a 151% increase in short-term certificates nationally between 2000 and 2010 (Carnevale, Rose et al., 2012; Dadgar & Weiss, 2012). The increase in short-term certificates further supports the need for more studies of post-secondary, short-term CTE programs in relationship to post-graduation employment income. Van Noy et al. (2008) suggested that noncredit-bearing CTE programs requiring post-secondary training in specific skills for credentials and certificates have a link with post-graduate employment income. Understanding the associations among the variables in this study contributed to the body of knowledge on post-graduation employment income in relation to noncredit-bearing CTE short-term program certificates, because credentials and certificates are often associated with noncredit-bearing institutions (Arkes, 1999). This study also corroborates with Rosenbaum and Pearson (2003), who concluded that throughout the vocational education literature, most findings consistently show that improved earnings do occur in situations where vocational training is directly related to job tasks (Rosenbaum & Pearson, 2003).
CTE short-term programs are structured educational skill program designs that help post-secondary institutions align program curriculum with local employers’ needs in communities. To adapt to the changing needs of the labor market, these skill program designs need to be flexible and adaptable to local employer’s needs. This is because active employer’s engagement reduces information asymmetry between prospective employees such as CTE short-term program graduates and employers. The purpose of this study was to explore the association between the employment incomes of post-secondary graduates from short-term CTE programs and their incomes before enrollment, the length of the programs, and the demographic characteristics of the participants. The research findings indicated that post-secondary CTE short-term graduates saw statistically significant increases in their income levels from their incomes prior to enrolling in the CTE short-term programs. The study therefore supports the notion that post-secondary, short-term CTE programs help to increase earnings for the underserved population who are economically disadvantaged in the area of study.
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